

IV. DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS AND OTHER AREAS OF CONCERN

As a result of this RFA, a total of 100 SWMUs and eight AOCs have been identified. These units are listed in Table III-2. The locations of SWMUs and AOCs are illustrated on the SWMU and AOC Location Map, included as Attachment A of this report. Specific locations within the Solid Waste Facility are provided for SWMUs 1 - 8, 12, 13, 15, and 17 - 19 on Figure III-11, and for SWMUs 9 - 11, 14, 16, 20, and 21 on Figure III-12. Specific locations are provided for SWMUs 23 - 25, 30, and 54 on Figure III-13.

The SWMUs and AOCs identified at MHR are described in detail on the following pages. As agreed with the EPA WAM, those units requiring no further action are summarized in Table IV-1 and detailed descriptions are not provided.

TABLE IV-1
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE
Sun Refining and Marketing Company

| Unit Number | Unit Name (Photograph Numbers) | Description/ Wastes Managed | Dates of Operation | Release Controls |
|-------------|--|---|-----------------------|---|
| 1 | Tank No. 1 Receiving Tank (1.1, 1.2) | 21,000-gallon, RCRA-regulated, waste receiving tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008 | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |
| 2 | Tank No. 2 Receiving Tank (2.1, 2.2) | 21,000-gallon, RCRA-regulated, waste receiving tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008 | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |
| 3 | Tank No. 3 Receiving Tank (3.1, 3.2) | 21,000-gallon, RCRA-regulated, waste receiving tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008 | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

| Unit Number | Unit Name (Photograph Numbers) | Description/ Wastes Managed | Dates of Operation | Release Controls |
|-------------|---|--|--------------------|---|
| 6 | Tank No. 6 Collection and Transfer Tank (6.1) | 2,000-gallon, RCRA-regulated, storage and transfer tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008 | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |
| 7 | Tank No. 51 Mix Tank (7.1) | 5,625-gallon, RCRA-regulated, mixing tank/ refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |
| 8 | Tank No. 52 Contact Tank (8.1) | 11,610-gallon, RCRA-regulated, contact tank/ refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

| Unit Number | Unit Name (Photograph Numbers) | Description/ Wastes Managed | Dates of Operation | Release Controls |
|-------------|---|---|-----------------------|--|
| 9 | Tank No. 53a Surge Tank (No Photograph) | 290-gallon, RCRA-regulated, surge tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, indoors, daily inspections (3 times/day), secondary containment |
| 10 | Tank No. 53b Surge Tank (No Photograph) | 290-gallon, RCRA-regulated, surge tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, indoors, daily inspections (3 times/day), secondary containment |
| 11 | Tank No. 53c Surge Tank (No Photograph) | 290-gallon, RCRA-regulated, surge tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, indoors, daily inspections (3 times/day), secondary containment |
| 12 | Tank No. 56 Filtrate Tank (12.1) | 5,625-gallon, RCRA-regulated, filtrate tank/ filtrate from refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, daily inspections (3 times/day), secondary containment |

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

| Unit Number | Unit Name (Photograph Numbers) | Description/ Wastes Managed | Dates of Operation | Release Controls |
|-------------|---|---|-----------------------|---|
| 14 | Tank No. 54 Precoat Tank (14.1) | 710-gallon mixing tank /wastewater from Middle Creek Surface Drainage System (SWMU 96) | 1979-present | carbon steel, pressurized tank, located indoors |
| 16 | Tank No. 57 Equalizing Tank (No Photograph) | 2,530-gallon, pressurized, surge- tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | high level alarms, indoors, daily inspections (3 times/day), secondary containment |
| 17 | Catalyst Fines Silo (17.1) | storage silo/ FCCU catalyst fines/ perlite or other precoat materials | 1979-present | closed-top, steel, tank on concrete- lined pad |
| 20 | Sludge Filter Press (20.1) | sludge filter press/ delisted, dewatered refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines | 1979-present | located indoors, second floor, above concrete-lined floor |
| 22 | Hazardous Waste Container Storage Pad (22.1) | RCRA-regulated drum storage area/ no wastes managed to present | 1983-present | concrete-lined pad and sump system, concrete-curbed containment |

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

| Unit Number | Unit Name (Photograph Numbers) | Description/ Wastes Managed | Dates of Operation | Release Controls |
|-------------|---|--|--------------------|---|
| 35-39 | 10-4 Plant Catalyst Fines Collection Roll-Offs | storage bins/ FCCU catalyst fines | 1963-present | closed-top steel container on concrete-lined pad |
| 41 | 10-4 Plant Spent Catalyst Silo (41.1) | storage silo/ FCCU spent catalyst | 1963-present | closed-top tank, concrete-lined pad |
| 42 | 10-4 Plant Electrostatic Precipitators (42.1) | air emission control units/FCCU spent catalyst fines | 1963-present | enclosed unit, concrete-lined pad |
| 44 | 10-4 Plant Catalyst Regeneration Unit (44.1) | catalyst regeneration unit/ FCCU catalyst | 1963-present | enclosed unit, concrete-lined |
| 45 | Garage High Pressure Wash Area (No Photograph) | indoor parts wash rack/water containing grease and oil | 1970-present | indoor unit on concrete-lined floor, collection, sump |
| 46 | Garage Aboveground Waste Oil Tank (46.1) | aboveground storage tank/ used crank case oil | 1970-present | fully enclosed steel tank, secondary containment with curbing |
| 47 | Mechanical Shop Saw Dust Collector (No Photograph) | dust collection unit/saw dust | 1970-present | fully enclosed metal unit on concrete-lined surface |

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

| Unit Number | Unit Name (Photograph Numbers) | Description/ Wastes Managed | Dates of Operation | Release Controls |
|-------------|--|--|--------------------|--|
| 48 | Mechanical Shop Sand Blast Unit (No Photograph) | glove box sand blast and collection unit/silica sand | 1970-present | fully enclosed indoor unit on concrete-lined floor |
| 49 | Mechanical Shop Wire Spray Unit (No Photograph) | spray booth/metal fines | 1970-present | indoor unit on concrete-lined floor, no venting to atmosphere |
| 52 | Laboratory Waste Accumulation Building (52.1, 52.2) | container storage building/chlorinated solvents, acids, bases, flammables, reactives | 1970s-present | indoor unit, all wastes in steel cabinets above concrete-lined floor |
| 54 | B & P Warehouse Drum Loading Area (54.1) | drum storage pad/hydrocarbon products | 1970s-present | concrete-lined unit, above concrete-lined parking area, drainage sumps |
| 58 | Slop Oil Tank V-29 (58.1, 58.2) | storage and transfer tank/slop oil | 1980s-present | fully enclosed steel tank, concrete-lined secondary containment |

4. UNIT NAME: Tank No. 4 Sludge Storage Tank
5. UNIT NAME: Tank No. 5 Sludge Decant Tank
(Photographs 4.1 - 4.5 and 5.1)

Unit Description: These RCRA-regulated units are located outdoors in the southwestern section of MHR adjacent to the lower portion of the Middle Creek Surface Drainage System (SWMU 96). Tank No. 4 is carbon steel with a capacity of 420,000 gallons and dimensions of 65 feet in diameter by 20 feet in height. Tank No. 5 is carbon steel with a capacity of 168,000 gallons and dimensions of 40 feet in diameter by 20 feet in height. The shell thickness of each tank is 0.25 inches. The tanks are part of the SWF and receive sludges and slurries from Tank Nos. 1, 2, and 3 Receiving Tanks (SWMUs 1 - 3). The tanks may also receive sludges and slurries from the Tank No. 6 Collection and Transfer Tank (SWMU 6). The sludges and slurries are first decanted in Tank 5 and then stored in Tank 4. The sludges and slurries are transferred to Tank No. 51 Mix Tank (SWMU 7), and the decanted water is transferred to the Tank No. 6 Collection and Transfer Tank (SWMU 6).

The tanks are located in a containment area (approximately 150 feet by 50 feet) which consists of a gravel base over soil surrounded by a two-foot high compacted earthen dike. The containment area is equipped with a release control valve. When the containment area fills with rainwater, the valve is opened and the contents of the containment area is released to the surrounding soils which drain to the Middle Creek Drainage System (SWMU 96).

Dates of Operation: The tanks were constructed between 1976 and 1978 and have been operating since 1979.

Waste Managed: The units receive non-hazardous and hazardous (K051) oil/water separator bottom sludges, unleaded and leaded (K052) tank bottoms, heat exchanger bundle cleaning sludge (K050), and acid sludge tank bottoms. The draft permit for the tanks includes the following RCRA hazardous wastes: K048, K049, K050, K051, K052, D001, D007, D008 (References 10, 14, 15).

4. UNIT NAME: Tank No. 4 Sludge Storage Tank
5. UNIT NAME: Tank No. 5 Sludge Decant Tank
 (continued)

Release Controls: These tanks are located in a gravel covered containment area with a two-foot high earthen perimeter dike. The containment area reportedly is designed to contain 100 percent of the capacity of the largest tank (i.e., 420,000 gallons). The tanks are equipped with high level alarms and are inspected for malfunctions and releases during each shift (three shifts per day).

History of Releases: According to a December 14, 1988 PADER inspection report, Tank No. 5 was overfilled and the contents (API separator sludge (K051)) was released to the containment area. As of January 23, 1989, Tank No. 5 was steam and detergent wasted to remove spill residue. According to the facility, stained soil was removed from the containment area and shipped to Envirosafe landfill in Oregon, Ohio.

As part of the closure plan portion of the their Part B permit application, the facility conducted composite soil sampling (0-2 ft. and 2-4 ft, depths) at seven locations within the secondary containment area around Tanks No. 4 and 5. The purpose of the sampling, performed in 1986, was to establish "background data to determine if soils are contaminated at the time of closure". The samples were analyzed for lead, cadmium and chromium (total and EP Toxicity). The sampling locations are shown in Figure IV-1 and the results are summarized in Table IV-2. These data indicate high levels total metals - lead, 38 - 1010 ppm, chromium 53 - 1120 ppm and cadmium in the 0.5 - 9.4 ppm range. The EP Toxicity results indicated cadmium in the 0.005 - 0.012 ppm range and lead in the 0.08 - 0.28 ppm range.

The VSI team observed what appeared to be dried sludge covering a 100 square foot section of the secondary containment area. The team also observed a depression within the containment to be stained with oil. A drain that appeared to be connected to the

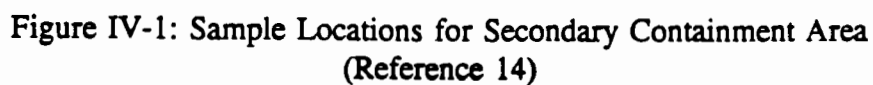


TABLE IV-2
COMPOSITE SOIL SAMPLE MEASURED CONCENTRATIONS

| SAMPLE LOCATION AND DEPTH(ft.) | TOTAL CONCENTRATION (ppm) | | | EP TOXICITY LEACHATE CONCENTRATION (mg/L) | | |
|-----------------------------------|---------------------------|-----------------|-------------|--|-----------------|-------------|
| | <u>Cadmium</u> | <u>Chromium</u> | <u>Lead</u> | <u>Cadmium</u> | <u>Chromium</u> | <u>Lead</u> |
| 1A (0-2') | ND ^a | 65 | 65 | ND | ND | ND |
| 1B (2-4') | ND | 53 | 38 | ND | ND | ND |
| 2A (0-2') | 1.1 | 97 | 289 | 0.008 | ND | ND |
| 2B (2-4') | 1.6 | 73 | 988 | 0.012 | ND | 0.28 |
| 3A (0-2') | 1.3 | 373 | 452 | 0.006 | ND | ND |
| 3B (2-4') | ND | 157 | 144 | 0.006 | ND | ND |
| 4A (0-2') | 1.0 | 415 | 375 | 0.009 | ND | 0.13 |
| 4B (2-4') | ND | 86 | 208 | 0.006 | ND | ND |
| 5A (0-4') | 9.4 | 1120 | 1010 | 0.022 | ND | 0.08 |
| 5B (2-4') | 1.0 | 336 | 402 | 0.012 | ND | ND |
| 6A (0-2') | 0.5 | 98 | 227 | 0.014 | ND | ND |
| 6B (2-4') | ND | 80 | 189 | 0.011 | ND | ND |
| 7A (0-2') | ND | 145 | 140 | 0.006 | ND | ND |
| 7B (2-4') | ND | 70 | 252 | 0.005 | ND | ND |

^a Not Detected

- 4. UNIT NAME: Tank No. 4 Sludge Storage Tank
- 5. UNIT NAME: Tank No. 5 Sludge Decant Tank
(continued)

Middle Creek Drainage System (SWMU 96) was observed next to the oily stained depression. The pipe was observed to be open during the VSI.

References: 10, 14, 15, 104, 369, 372

13. UNIT NAME: Tank No. 50 Lime Slurry Tank
15. UNIT NAME: Tank No. 55 Hot Water Wash Tank
(Photographs 13.1 and 15.1)

Unit Description: These outdoor closed top tanks are located on the southwestern section of MHR. They are part of the Solid Waste Facility (SWF) which consists of a number of tanks and buildings built into one foundation. As shown in Figure III-11, both units are located on the Filter Press Building's northeast side.

Tank No. 50 is of poured reinforced concrete with a capacity of 1,615 gallons and dimensions of 8 ft. by 8 ft. by 8 ft. with a shell thickness of 12 inches. Tank No. 55 is also of poured reinforced concrete with a 5,385 gallon capacity and dimensions of 8 ft. by 8 ft. by 11.25 ft. with a shell thickness of 12 inches. The bottom portions of the tanks are partially below-grade and part of the SWF foundation. They could not be observed during the VSI.

In tank No. 55, the Lime Slurry Tank, lime from the lime storage bin is mixed in a continuous process with process wastewater to form a lime slurry prior to being discharged to Tank 51 (SWMU 7) for treatment.

In Tank No. 50, the Hot Wash Tank, water from the Middle Creek Surface Drainage System (SWMU 96) is heated prior to being discharged to the Sludge Filter Press (SWMU 20).

Dates of Operation: The tanks were constructed between 1976 - 1978 and operations were begun in 1979. Both tanks are currently in operation.

Waste Managed: The units manage wastewater containing oil and hydrocarbons. According to facility representatives, the process wastewater in Tank No. 50 may contain up to 30 percent oil. **However, the facility has reported that the concentration of oil and grease in the wastewater is normally less than 100 ppm.** The wastewater in Tank No. 55 is from the Middle Creek Surface Drainage System (SWMU 96) and contains hydrocarbons.

13. UNIT NAME: Tank No. 50 Lime Slurry Tank
15. UNIT NAME: Tank No. 55 Hot Water Wash Tank
(continued)

Release Controls: These tanks are surrounded by other concrete structures within the SWF and are equipped with high-level alarms. According to facility representatives, both tanks were sprayed with a gunnite protective coating at the time of construction, though the bases of the tanks have no specific protection.

History of Releases: No evidence of release was identified through review of the available file materials. During the VSI, the visible portions of the tanks appeared to be intact and uncracked. However, a large portion of the tanks could not be observed, including the base, because of the unit construction into the SWF.

References: 10, 14, 15, 369, 372

18. UNIT NAME: Lime, Spent Clay, and Catalyst Loading System
 (Photographs 18.1)

Unit Description: This inactive unit is located outdoors on the north side of the SWF in the southwest section of the facility. The unit is situated in an area approximately 25 feet by 10 feet between the Catalyst Fines Silo (SWMU 17) and the Lime Silo. The unit is constructed of steel beams, hoppers, bunkers, and conveyors and was designed as a tilt-frame unloading system similar to those systems used for roll-off containers. The base of the unit is partially below-grade having been constructed inside a concrete containment area that is approximately three feet deep. The above-grade portion of the unit is situated next to an area that is partially gravel and partially paved.

The unit was used to unload containers that transported spent clay from the Clay Contact Plant Area (SWMU 57) and Spent Catalyst Fines generated at the 10-4 Plant Roll-Off Storage Area (SWMU 40) to the SWF. The unit is also equipped with a pneumatic truck-unloading system for product lime. The waste materials were emptied into bunkers. Conveyors were used to transfer the materials into the No. 51 Mix Tank (SWMU 7) (clay), the Catalyst Fines Silo (SWMU 17) (catalyst fines), or the Lime Silo (lime).

Dates of Operation: The unit operated from 1979 to 1983.

Waste Managed: The wastes managed by the unit included spent clay and catalyst. The unit received spent clay from the Contact Plant containing acids, caustics, sulfonates, water, and aromatics from specialty oils. The clays had a hydrocarbon content of approximately 30 percent. The catalyst fines consist largely of aluminum silica, and was thought to contain some trace heavy metals.

Release Controls: Although the bottom portion of the unit sits inside a below-grade concrete containment area approximately three feet deep, there are no release controls for the above-grade portions of the unit, where the primary waste management activities would have taken place.

18. UNIT NAME: Lime, Spent Clay, and Catalyst Loading System
(continued)

History of Releases: No evidence of release was identified through review of the available file materials. During the VSI, the unit was observed to be rusted, though no specific staining of the gravel was noted.

References: 10, 14, 15, 324, 349, 369, 369

19. UNIT NAME: Sludge Receiving Trough
 (Photographs 19.1 - 19.6)

Unit Description:

This unit is located outside the southeast corner of the SWF in the southwest section of the facility. The trough is concrete with dimensions of 40 ft. by 25 ft. in area with a depth of about 5 ft. on three sides and about 3 ft. deep on the fourth side. The trough itself is situated about 3 ft. into a larger concrete slab which extends away from the trough to form a truck ramp. The trough is located at the top of this slab with the walls of the trough extending 5 feet above the structure on three sides and about six inches on the front side (or unloading end). The truck ramp is a concrete slab approximately 130 feet in length by 50 feet wide by 6 feet thick and slopes to the gravel surface at the western side of the SWF which serves as a parking area. The area to the east of the Sludge Receiving Trough and the SWF is gravel covered and is within the containment area for Tank Nos. 4 and 5 (Sludge Storage and Decant Tanks, SWMUs 4 and 5).

The trough is the first unit in the SWF treatment train. Trucks containing untreated sludges and slurries back up the truck ramp, then dump their loads into the front of the trough. Available file information indicated that the capacity of the trough was 5,000 gallons. This capacity, however, would require that all four sides of the unit be the same height. The front wall of the unit has been reduced to a height of approximately six inches above grade vs. about 2.5 feet above grade (for the other walls). A roll-off container (discussed below) is also located on the eastern end of the slab.

Sludges and slurries from various generation points within MHR (e.g., oil/water separators, the Heat Exchanger Bundle Cleaning Area (SWMU 62), product tank cleaning operations) are dumped from trucks into the trough. The trough contains a bar screen and comminutor for removing debris and lumps from the treatment plant feed. The debris that is removed is placed in a small wagon and transported to the 8 cubic yard roll-off container for storage. The

19. UNIT NAME: Sludge Receiving Trough
(continued)

slurry and sludge wastes from the trough are discharged into the Receiving Tanks 1 - 3 (SWMUs 1 - 3). Wastes may also be pumped directly from trucks using hoses through an opening in the upper-southern wall of Tank No. 1 Receiving Tank (SWMU 1). There is a drain at this unit which flows directly to the Middle Creek Surface Drainage System (SWMU 96)

Dates of Operation: The Sludge Receiving Area was constructed in 1976 - 1978, first operated in 1979, and is currently in operation.

Waste Managed: The Sludge Receiving Area manages refinery sludges and slurries including non-hazardous and hazardous (K051) oil/water separator bottom sludges, unleaded and leaded (K052) tank bottoms, heat exchanger bundle cleaning sludge (K050), and acid sludge tank bottoms. The draft permit for the SWF tanks, which manage the same wastes as the Sludge Receiving Area, includes the following RCRA hazardous wastes: K048, K049, K050, K051, K052, D001, D007, D008 (References 10, 14, 15).

Release Controls: An approximately four-foot steel extension has been added to the back wall of the sludge Receiving Trough (eastern end) to limit splashing of wastes as they are dumped into the trough. Run-off from the top portion of the truck ramp is routed to a grated drain which discharges through a pipe to the neutralization basin portion of the Middle Creek Surface Drainage System (SWMU 96). Run-off from the lower portion of the truck ramp flows down the ramp and onto the paved parking area on the west side of the SWF or the gravel area on the south side of the SWF.

History of Releases: No information on releases was identified in the available file information. However, during the VSI, heavy dark, oily staining was noted on and over the walls of the trough, over the entire truck ramp, and on the back of the eastern side of the concrete

19. UNIT NAME: Sludge Receiving Trough
 (continued)

 slab underlying the unit. The staining on the truck ramp appeared to follow run-off pathways down the truck ramp to the gravel parking area on the west side of the SWF.

References: 10, 14, 15, and 369

21. UNIT NAME: Filter Cake Knock-Out Area
 (Photograph 21.1)

Unit Description: The Filter Cake Knock-Out Area is located in a concrete room on the ground-level of the Filter Press Building in the southwestern section of MHR at the SWF. The unit is a concrete area approximately 8 ft. by 15 ft. with a 30-yard steel roll-off container. The floor of the area is equipped with roll tracks for the container and is open on the west side so that the roll-off container can be moved in and out of the area. There are garage-type overhead doors on the opening of the room leading to the parking lot.

Filter cake from the SWF treatment process Sludge Filter Press (SWMU 20) is dropped into the roll-off container through a chute connected to the Sludge Filter Press (SWMU 20) located above the unit on the second floor of the Filter Press Building. Plastic splash guards have been added to the chute to minimize overflow from the container during loading.

During the VSI, the concrete flooring under the container was stained and the area between the roll tracks looked to be damaged. Track out to the gravel parking area was also observed during the VSI.

Dates of Operation: The Filter Cake Knock Out Area was constructed in 1976 - 1978 and was first used in 1979. The unit is currently in operation.

Waste Managed: The waste managed in this unit is hazardous waste filter cake from the dewatering and treatment of refinery sludges and slurries at the SWF. The average solids content of the cake is 65 - 70%, and the average oil content is 2 - 4%. It is estimated that 2 - 3 roll-off containers of waste are generated per day during the 4 - 6 months of the year that the SWF is in operation.

Release Controls: Release controls for this unit include splash guards, which were recently added to reduce spillage, partial enclosure within a concrete room, and doors on the opening of the room. However, there are no release controls to prevent track-out.

21. UNIT NAME: Filter Cake Knock-Out Area
(continued)

History of Releases: During the VSI, evidence of splashing and overflow of filter cake from the container was noted, including stains on the walls of the containment room and dirt-like debris in the track area of the floor.

References: 10, 14, 15, 369

23. UNIT NAME: Old Sludge Basin
24. UNIT NAME: Old Decant Basin
 (Photographs 23.1 - 23.3 and 24.1 - 24.3)

Unit Description: These former units are situated beneath and to the west of the Hazardous Waste Container Storage Pad (SWMU 22) in the southwestern section of the facility. The former units were unlined surface impoundments used for the disposal of API separator sludges and leaded tank bottoms. The two basins are immediately adjacent to one another, with the Old Sludge Basin on the west side and the Old Decant Basin on the east. The combined dimensions of the units are reported as being 280 feet by 220 feet, covering approximately 1.4 acres.

Sometime in the late 1970s, the facility stopped using the units. The wastes were reportedly stabilized with fly ash and area was regraded. The two basins were consolidated into one basin during these activities. During the VSI the exact boundaries of the units could not be identified, but it was noted that the top of the identifiable part of the units is two to four feet above grade. Other aspects of the units could not be evaluated during the VSI due to their below-ground location and covered condition. The approximate location of these former units is shown in Figure III-13.

Dates of Operation: The units operated between the 1950s and the late 1970s.

Waste Managed: The impoundments reportedly received API separator sludges and leaded tank bottoms. According to the facility's 1980 Notification of Hazardous Waste Site(s), the two units together contain up to 490,000 cubic feet of waste treated with fly ash.

Release Controls: There were no release controls associated with these units during their active life. The waste was reportedly stabilized with fly ash. During the VSI it appeared that the units were covered with soil.

23. UNIT NAME: Old Sludge Basin
24. UNIT NAME: Old Decant Basin
(continued)

History of Releases: No evidence of release was identified in the available file information. During the VSI, no evidence of release was noted on the visible portions of the units. However the units managed hazardous waste in contact with bare soil during their operating lifetimes.

References: 2, 367 and 369

25. UNIT NAME: Old 12 Plant Sludge Basin
(Photographs 25.1 - 25.3)

Unit Description: This inactive unit is located between Hewes Avenue and Green Street in the vicinity of the Crude Unit in the northeast section of the facility. A small rail yard is situated between the unit and the Crude Unit. The unit is adjacent to Walkers Run on the northern portion of the Middle Creek Surface Drainage System (SWMU 96). The unlined basin was used for the disposal of acid sludge generated by lube oil manufacturing operations. The basin was partially covered with soil and gravel at some point after the 1940s and the exact boundaries and dimensions of the basin are not known. A review of available core boring logs, recorded during 1956, indicate the basin covered approximately 9.3 acres. The approximate boundaries of the basin are shown in Figure IV-2. During the VSI, the southern portion of the unit, which was observed to be covered with soil and gravel, was being used for the storage of railroad ties and equipment.

During the VSI, pockets of acid sludge resembling asphalt were observed to be seeping through the ground surface at several points. The northern portion of the unit, which is uncovered, was observed to contain asphalt-like sludges and pools of dark, oily liquid.

Dates of Operation: The unit was operated from the 1920s until the 1940s.

Waste Managed: The unit received acid sludges from petroleum refining operations. Analysis of core boring logs, recorded during 1956, indicated that the unit contains approximately 3.2 million cubic feet of acid sludge mixed with fill material consisting of cinders and unspecified debris. A portion of the unit is currently being used to store railroad ties and equipment, though the facility claims these are not wastes.

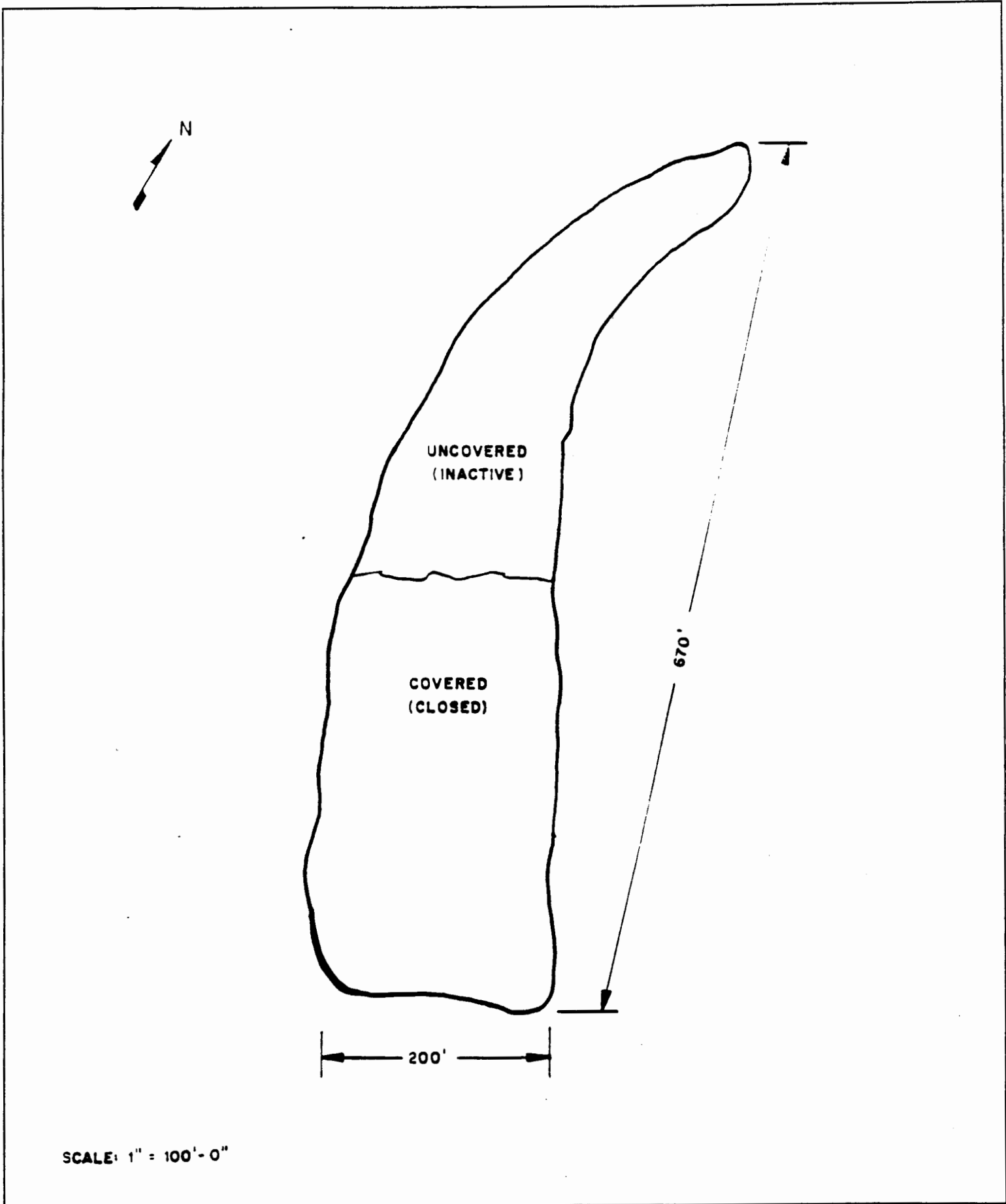


Figure IV-2: Layout Plan for Old 12 Plant Sludge Basin (SWMU 25)
(Reference 2)

25. UNIT NAME: Old 12 Plant Sludge Basin
 (continued)

Release Controls: There are no known release controls for this
 unlined unit other than partial coverage of
 the southern portion with soil and gravel.

History of Releases: There are no releases identified in the
 available material. However, this is an
 unlined unit and during the VSI seepage was
 noted in several areas along the covered
 portion of the unit and the uncovered
 portion was observed to contain sludges and
 pools of oily liquids.

References: 2, 354, 367, and 369

26. UNIT NAME: Old 18 Plant Sludge Basin
 (Photographs 26.1 - 26.2)

Unit Description: The unit is located in the vicinity of the 18 Plant in the eastern section of MHR. A cooling tower and at least portions of several product storage tanks have been constructed on top of the unit. The unit consists of an unlined basin that reportedly received acid sludge. The unit is approximately three acres in area, though there is no information on the exact boundaries or dimensions of the basin. The area of the unit not having process units on it was observed to be covered with gravel at the time of the VSI. According to the Notification of Hazardous Waste Site form submitted to EPA by the facility, an unspecified portion of the waste was removed from the unit at some time in the past.

Dates of Operation: The unit operated prior to the 1950s.

Waste Managed: The unit received acid refinery sludges. According to the core boring logs recorded during 1951, the unit may have received up to 760 million cubic feet of acid sludge and fill material. The fill material was described as similar to the fill disposed of in the Old 12 Plant Sludge Basin (SWMU 25).

Release Controls: The unit has been covered with soil and gravel. There are no other known release controls for this unlined unit.

History of Releases: There were no releases identified in the available file information, however, the unit is unlined. During the VSI, the unit was observed to be covered with soil and gravel. Some surface staining was noted, but no sludges or seeps were observed.

References: 2, 367, and 369

27. UNIT NAME: Phillips Island Area
 (Photographs 27.1 - 27.4)

Unit Description: The unit is a fill area located northwest of Dock 3 in the southern section of the facility. The unit received fill materials reportedly for real estate development purposes between the 1950s and late 1970s. Some of the fill reportedly contained hazardous wastes or constituents. The Phillips Island area is also the location of the Phillips Island Maintenance Storage Area (SWMU 28), the Phillips Island Roll-Off Storage Area (SWMU 29), the Phillips Island Old Drum Storage/Small Roll-Off Area (SWMU 30), the Fire Fighter Training Area (SWMU 31), Impoundment Tank T-101 (SWMU 32), the Phillips Island Surface Drainage Ditches (SWMU 33), and the Phillips Island Sand Blasting Area (SWMU 34).

This unlined landfill is approximately 27 acres in aerial extent and is bounded by the Delaware River on the south. The exact dimensions, including depth of fill, are not known and the locations of the western, northern and southern boundaries are not known.

One five-acre area of the Phillips Island Area was filled and regraded in the 1980s using a 50%/50% mixture of soil and incinerator ash from the DELCORA wastewater treatment facility. A November 13, 1985 letter from PADER (Reference 100) granted approval for receipt of 9,000 tons of incinerator ash to be used as fill to provide stabilization for the area. Another document indicates that as much as 18,000 tons of the material was disposed of in the area. Facility representatives reported that the ash was used in the southern portion of Phillips Island, adjacent to the Delaware River.

During the VSI, the area was observed to be partially vegetated, with the remainder of the area covered with soil. At the time of the VSI, the southeast portion of the unit was being used to store gravel material removed from above-ground containment areas throughout the facility.

27. UNIT NAME: Phillips Island Area
(continued)

Dates of Operation: The unit received waste from the 1950s to the late 1970s, and ash in approximately 1985 - 1986.

Waste Managed: From the 1950s to the late 1970s the unit received construction debris, granite rubble, foundry slag, incinerator ash that may have been EP toxic, soil, spent Fuller's earth, alumina-silica catalyst fines, domestic refuse. The unit also received an estimated 4556 cubic yards of API separator bottoms mixed with fly ash.

During the 1980s, ash described as ash from incineration of wastewater treatment sludge generated at the DELCORA facility in Chester, PA was used to fill and regrade the surface of a portion of the Phillips Island Area. The ash is described as solid (equal to or greater than 20% solid by dry weight and non-flowable), having a pH between 5.8 and 7.7, and non-hazardous (does not fail the EP toxicity characteristic). According to information provided by facility personnel, the unit may have also been the location of unlined crude oil impoundments during the early history of the facility.

Release Controls: The unit is covered with soil and partially vegetated. There are no other known release controls for this unlined unit.

History of Releases: There were no releases identified in the available file information, however, the unit is unlined. During the VSI, the unit was observed to be partially vegetated. The soils covering the remainder of the unit were dark and appeared to be stained in various areas, though this seemed to be attributable to activities taking place on the surface of the unit (e.g., storage of gravel from containment areas). No evidence of seepage was noted.

References: 50, 76, 87, 89, 66, 101, 367 and 369

28. UNIT NAME: Phillips Island Maintenance Storage Area
 (Photograph 28.1)

Unit Description: The Phillips Island Maintenance Storage Area is located on the surface of the Phillips Island Area (SWMU 27) in the southwestern portion of MHR. The area is located to the west of the southern terminus of Blueball Avenue. The storage area is used by the MHR Maintenance Department for storage of scrap metal, equipment pieces and parts, construction materials, and other items. According to the facility representatives, these items may or may not be reused in the future. The area is approximately 50-yards square and has soil and gravel berms approximately 15-feet high on the north, west, and south. The northern berm is free-standing and the southern and western berms are formed by an increase in the surface grade on these sides. The eastern side of the unit is controlled with a five-foot dust fence. The floor of the unit is bare soil (Phillips Island fill) and gravel. Run-off from the unit would flow to the Combined Process/Storm Sewer System (SWMU 95) through drains along Blueball Avenue.

During the VSI, the unit was observed to be storing a variety of wastes in several piles around the area. Wastes identified included used piping and scrap metal, wood boxes and pallets, and various construction debris. Several discolored patches of soil were also noted.

Dates of Operation: The unit has been in operation since approximately 1980 and is currently in use.

Waste Managed: The wastes managed in the unit include scrap metal, used equipment (primarily valves and pipes), and construction materials. The used equipment is likely to be contaminated with residual oil and petroleum wastes, as there is no evidence that these materials are drained or in any way cleaned prior to placement in this area.

Release Controls: The unit has soil and gravel berms on three sides. However, the unit is unlined and there are no other release controls.

28. UNIT NAME: Phillips Island Maintenance Storage Area
 (continued)

History of Releases: There were no releases identified in the
 available file information, however, wastes
 (potentially contaminated with petroleum
 products) are stored directly on the ground.
 During the VSI, discolored soils were noted
 in several areas of the unit.

References: 369

29. UNIT NAME: Phillips Island Roll-Off Storage Area
(Photographs 29.1 - 29.3)

Unit Description: The Phillips Island Roll-off Storage Area is situated on the surface of the Phillips Island Area (SWMU 27) in the south western portion of MHR. The area is located to the west of the intersection of Blueball Avenue and Second Street. The unit consists of an unpaved area, partially covered with gravel, in which approximately 35 20-yard roll-off dumpsters are staged and stored. The area is approximately 75 yards long (north - south) and 35 yards wide (west - east). According to facility representatives, the majority of the dumpsters presently stored in the area are usually empty. One dumpster in the area is used to store asbestos that has been removed from various locations prior to shipment off-site. At the time of the VSI, approximately five dumpsters contained spent 10-4 Plant FCCU catalyst. The area around these dumpsters appeared to have had catalyst spilled onto it. A drainage ditch runs along the east side of the area (parallel to Blueball Avenue). This drainage ditch and run-off from the unit flow to the Combined Process/Storm Sewer System (SWMU 95) through drains along Blueball Avenue.

Dates of Operation: The unit has been in operation since approximately 1970 and is currently in use.

Waste Managed: Wastes managed in dumpsters in this area include bagged asbestos, general refuse, and spent catalyst from the 10-4 Plant FCCU. The composition of the catalyst is approximately 70% silica and 30% alumina. The spent catalyst also contains 2 -3 ppm nickel as a contaminant. Occasionally, dumpsters containing filter cake from the Solid Waste Facility may be staged temporarily in the area prior to shipment off-site for disposal. Facility representatives indicated that approximately 400 tons (25 roll-off boxes) of spent catalyst had been transferred in the area recently due to a maintenance shut-down of the 10-4 Plant.

Release Controls: The unit has no release controls and the area is unpaved.

29. UNIT NAME: Phillips Island Roll-Off Storage Area
 (continued)

History of Releases: No information on releases from this unit was identified in the available file material. During the VSI, quantities of a fine, grey particulate material were observed to be on the ground in the area, particularly near the ramp where spent catalyst from trucks is dumped into the roll-off boxes. The soils in the area were dark with staining noted in several places.

References: 369

30. UNIT NAME: Phillips Island Old Drum Storage/Small Roll-Off Area
(Photograph 30.1)

Unit Description: The Phillips Island Old Drum Storage/Small Roll-off Area is situated on the surface of the Phillips Island Area (SWMU 27) in the south western portion of MHR. The area is located to the northwest of Impoundment Tank T-101 (SWMU 32) on the southeastern corner of the intersection of Ethylene Boulevard and the SunOlin Access Road. The unit consists of an unpaved area that is partially covered with gravel. The area is approximately 200 feet (north-south) by 100 feet (west-east) and is currently used for the temporary storage of wastes in roll-off containers while analysis is conducted or appropriate disposal arrangements are made. At the time of the VSI, approximately 35 6- and 8-yard roll-off containers were stored and staged in the area.

During the VSI, the roll-off containers were observed to be extensively rusted and the soils were dark with staining noted in several areas of the soils and gravel.

Dates of Operation: Facility representatives estimated that this unit has been in operation for 10 to 20 years.

Waste Managed: The wastes presently stored in roll-off containers in the area include asphaltic sludges, general refuse, and hydrocarbon contaminated soils from spill cleanups. Based on the facility's designation of the area as the "old drum storage area", it is likely that this area was used to store drummed waste. However, the facility representatives were not able to identify the type or quantity of waste.

Release Controls: There are no release controls for the unit.

30. UNIT NAME: Phillips Island Old Drum Storage/Small Roll-Off
Area
(continued)

History of Releases: During the VSI several stained areas were
noted in the area, particularly near the
roll-off containers. No evidence of release
was identified in the available file
materials.

References: 2, 62, 369

31. UNIT NAME: Fire Fighter Training Area
 (Photographs 31.1 - 31.5)

Unit Description: This unit is situated on the surface of the Phillips Island Area (SWMU 27) in the southern section of the facility. The unit includes the area which is currently used for fire fighting training and the areas, reported to be to the south of the current area, that were previously used for fire fighting training.

The portion of the unit that is currently used for these training activities is located in a fenced area immediately to the west of the Phillips Island Roll-Off Storage Area (SWMU 29). This area consists of a gravel-covered area approximately 50-yards square which includes a 20- by 60-foot concrete pad with a six-inch curb and two 15-foot diameter half tanks, about 15 feet high. The area is fenced and also includes several product storage tanks and a diked area which is an emergency ground flare for the refinery.

For the current fire training exercises on the pad, No. 2 fuel oil is piped into metal structures situated on the pad. The structure is lighted and then extinguished by trainees. In the half-tanks, gasoline and No. 2 fuel oil are floated on water, burned, and put out by trainees. Residual liquids from the fire fighting operations (pad and tanks) are drained into an unlined, 3-foot deep, rip rap-filled french drain system located along the northern perimeter of and to the west of the concrete pad. The french drain reportedly flows to the Middle Creek Surface Drainage System (SWMU 96). The exact route of flow was not known.

Before the pad was installed, the training activities were conducted over bare soil and gravel. There were no controls to prevent spillage of fuel oil as it was applied to the structure. The exact location and dimensions of the former training operations are not known. According to facility representatives, these previous

31. UNIT NAME: Fire Fighter Training Area
(continued)

operations were conducted on soil or gravel rather than concrete. Based on typical fire fighting activities, it is likely that these activities involved placement of combustibles containing fuel oil directly on the soil, burning, extinguishing and leaving the residuals in place.

Dates of Operation:

The facility first requested permission to conduct fire fighting training in 1972. PADER approved the activities on August 18, 1972 (References 159, 160). The exact dates of operation for the former areas are not available. The concrete pad in the current fire training location was constructed approximately two years ago. Current training is conducted 2 -3 times per week.

Waste Managed:

Gasoline, propane, and No. 2 fuel oil are used to generate the fires. Various types of extinguishers are used, however, the most frequently used is the dry chemical Purple K.

Release Controls:

Release controls for the current area include a concrete pad and State restrictions on the number and length of burning episodes and a prohibition on fire training during periods of air stagnation. Previously, this area, and the former areas used for fire fighting training, were unpaved.

History of Releases:

Excessive smoke was noted from MHR fire fighting exercises by a PADER inspector on April 13, 1989 (Reference 295). During the VSI, dark oily stains were noted on the concrete pad and on the gravel pack in the unlined french drain. Staining was noted along the drain lines from both half-tanks to the central drain line (adjacent to the pad), and from the pad to the perimeter of the fenced area on the west (near a roadway).

References:

159, 160, 295, and 369

32. UNIT NAME: Impoundment Tank T-101
 (Photographs 32.1 - 32.3)

Unit Description: The unit is located at Phillips Island in the vicinity of the SWF in the south section of the facility. The open topped tank is approximately 25 feet above grade, 300 feet in diameter, and has a capacity of 13.5 million gallons. The tank is constructed of concrete and the walls are approximately one-foot thick. Facility representatives estimated that the tank volume includes approximately 10 feet of additional below-grade depth.

The tank is used as an equalization and storage basin for process wastewater and for storm water from the Middle Creek Surface Drainage System (SWMU 96). During storm events, the tank is used to minimize overflow of the Middle Creek Surface Drainage System (SWMU 96) and to regulate flow to the DELCORA POTW. Water from the Middle Creek Surface Drainage System (SWMU 96) is pumped into the unit when the level of the creek reaches 7.75 feet. Floating oil skimmers are designed to remove free oil from the surface of the water which is discharged to the facility's slop oil refinery system. The water is returned to the Middle Creek Surface Drainage System (SWMU 96) by gravity flow when the storage capacity is no longer needed. At the time of the VSI the oil skimmers appeared not to be operational and the surface of the water in the tank was covered with a thick, oily substance.

Dates of Operation: The unit has been in operation since approximately 1974.

Waste Managed: The unit receives process wastewater and storm water containing free oil from the Middle Creek Surface Drainage System (SWMU 96).

Release Controls: The unit reportedly has level gauges. No additional release controls other than gravity flow lines for emptying the unit were identified.

32. UNIT NAME: Impoundment Tank T-101
 (continued)

History of Releases: No evidence of release was identified in the
 available file materials. During the VSI,
 hydrocarbon odors were noticed in the
 vicinity of the unit.

References: 2, 111, 339, and 369

33. UNIT NAME: Phillips Island Surface Drainage Ditches
 (Photograph 33.1)

Unit Description: The Phillips Island Surface Drainage Ditches are located in the northern portion of the Phillips Island Area (SWMU 27), to the west and north of Impoundment Tank T-101 (SWMU 32). The ditches are unlined, and range from approximately 4 to 10 feet wide and are not more than two feet deep. The ditches handle run-off from the general area. The ditches flow west into drains along Blueball Avenue, which lead to an underground sewer line (Combined Process/Storm Sewer System (SWMU 95)) which discharges into the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The date of construction of the Phillips Island Surface Drainage Ditches was not known. The unit is currently in operation.

Waste Managed: The unit manages run-off from the Phillips Island Area (SWMU 27) which contains petroleum sludges.

Release Controls: There are no release controls for this unit.

History of Releases: No evidence of release was identified in the available file material, however, the unit is unlined. During the VSI, the ditches were partially filled with run-off water. The sides of the ditches were observed to be discolored.

References: 369

34. UNIT NAME: Phillips Island Sand Blasting Area
 (Photographs 34.1 - 34.3)

Unit Description: The Phillips Island Sand Blasting Area is situated on the surface of the Phillips Island Area (SWMU 27) in the southern section of the facility. The unit is located to the south of the Fire Fighter Training Area (SWMU 31). The surfaces of new piping and other metal parts and equipment are cleaned in the area by blasting with silica sand. A tank and compressor system are used to propel the blasting agent. The area used for blasting is unpaved and is approximately 50 yards square in area. The used blasting agent is left on the soil in the area. The sand blast residues are reportedly removed annually, though the final disposition of these wastes is not clear.

Although the facility stated that only new parts were sand-blasted in this area, various pieces of rusted piping and scrap metal parts were observed at the unit during the VSI.

Dates of Operation: The Phillips Island Sand Blasting Area has likely been in operation for the last ten or twenty years.

Waste Managed: The unit manages used silica sand blast residue contaminated with metals.

Release Controls: There are no release controls at this unit.

History of Releases: No evidence of release was identified in the available file information. During the VSI it was observed that accumulated used sand blast medium covers the soil in the area. In some areas the sand blast residue appears to be piled up to a thickness of at least a foot. The soil at the perimeter of the sand residues was discolored.

References: 369

40. UNIT NAME: 10-4 Plant Roll-Off Storage Area
 (Photograph 40.1)

Unit Description: The unit is located in the vicinity of the FCCU in the northeast section of the facility. The unit is used to stage the 10-4 Plant Catalyst Fines Collection Roll-Offs (SWMUs 35-39) prior to transport to the SWF where the fines are used as a precoat (Tank No. 54 Precoat Tank - SWMU 14) for the Sludge Filter Press (SWMU 20). Roll-offs containing spent FCCU catalyst from the 10-4 Plant Spent Catalyst Silo (SWMU 41) are also staged in the area prior to transport to the Phillips Island Roll-Off Storage Area (SWMU 29) and/or subsequent transport off-site for disposal. The unit is an unpaved, outdoor area approximately 200 feet (north - south) by 50 feet (west - east). At the time of the VSI, approximately 20 30-cubic yard roll-off containers were located in the area.

Dates of Operation: The unit has been in operation since 1945.

Waste Managed: FCCU catalyst fines and spent aluminum-silica catalysts are stored in roll-off containers in this unit. The catalyst may contain 2 - 3 ppm nickel as a contaminant.

Release Controls: The wastes are stored in covered, steel roll-off containers. There are no release controls during waste transfer operations.

History of Releases: The unit is unpaved. During the VSI, gray residues were noted on the ground surface within the area. No evidence of release was identified in the available file material.

References: 369

43. UNIT NAME: 10-4 Plant Sour Water Stripper
 (Photograph 43.1)

Unit Description: The unit is located at the FCCU in the north section of the facility. The unit is a steel packed tower stripper used to control sulfur emissions from the steam and flue gases emitted from the FCCU. The unit is situated on a concrete surface in the FCCU process area and has a throughput of 200 gallons per minute. The resulting sour water containing H₂S is piped to the gas plant located to the west of the facility where the sulfur is recovered.

During the VSI, the base of the unit appeared to be impaired and the concrete area was observed to be stained.

Dates of Operation: The unit has been operating since 1964.

Waste Managed: Sour water, containing sulfides, mercaptans, and phenols.

Release Controls: The process area is drained, through the Combined Process/Storm Sewer System (SWMU 95), to the 10 Oil/Water Separators (SWMUs 81, 82), and then to the Middle Creek Surface Drainage System (SWMU 96).

History of Releases: No evidence of release was identified in the available file material. During the VSI, the base and concrete pad at the unit was stained, though no releases to surrounding soils were noted.

References: 156 and 369

50. UNIT NAME: Mechanical Shop Equipment Wash Rack
 (Photograph 50.1)

Unit Description: The outdoor unit is located adjacent to and south of the Mechanical Shop Building in the central section of the facility. The unit is a grated sump over which high pressure water and a cleaning solution are used to clean metal parts, machinery, and equipment. The unit drains, through a drain in the sump and the Combined Process/Storm Sewer System (SWMU 95), to the 1F Oil/Water Separator (SWMU 68), and then to the Middle Creek Surface Drainage System (SWMU 96). The unit consists of a grated, in-ground, concrete sump approximately 15 by 12 feet in area and six inches deep. Above the grate, the unit is enclosed by brick or concrete block walls approximately six-feet high on three sides. The fourth side (south), is open to a paved parking area. A high pressure water connection and hose are located over the grate.

Dates of Operation: The unit has been in operation since the Mechanical Shop was constructed in the 1970s.

Waste Managed: Wash water containing residual oil and sludges.

Release Controls: The walls and surrounding concrete area provide control for the overspray.

History of Releases: During the VSI, evidence of staining was noted on the asphalt parking area adjacent to the unit. However, no evidence of release to soils was noted. The bottom of the sump could not be inspected during the VSI. No evidence of release was identified through review of the available file materials.

References: 369

51. UNIT NAME: Dock No. 2 Recovery Well System
 (Photograph 51.1)

Unit Description: The unit is located at Dock No. 2 which runs along the Delaware River in the south section of the facility. The Dock No. 2 Recovery Well System includes a horizontal, above-ground 5,000 gallon steel tank and associated hosing which is connected to a recovery well. The system was first installed in response to reappearing sheens on the nearby Delaware River for which there was no immediate explanation. The system has recovered increasing quantities of a substance the MHR lab believes to be kerosene. Total recovery as of the end of 1988 was 31,000 gallons (Reference 147). A pump installed in the well automatically pumps the hydrocarbon layer, which floats on the groundwater, to the tank. The kerosene is periodically removed from the tank for disposal off-site. During the VSI, the tank appeared to be in good condition, although some staining was noted.

Dates of Operation: The recovery system was installed in 1987 and is currently in operation.

Waste Managed: A hydrocarbon substance believed to be kerosene is managed here.

Release Controls: The tank is constructed of steel and is closed. No other release controls are associated with this unit.

History of Releases: No information on releases was identified in the available file material. During the VSI, evidence of staining was noted in the area between the tank and the well and beneath the tank at the hose connections.

References: 141, 147, 149, 150, 151, 152, and 369

53. UNIT NAME: 8-C Crude Unit Drip Showers
 (Photographs 53.1 - 53.2)

Unit Description: This outdoor unit is located at the 8-C Crude Unit in the east section of the facility. The unit consists of four grated sumps. Originally, this unit was used to cool drums of carbon disulfide (which was used in the past to pretreat the 8-C Unit catalyst) by spraying them with water. The unit is currently used to clean residual oil and sludges from used parts, machinery, and equipment. The unit is approximately 30 feet square and is separated into four quarters. Above the grates, each sump is enclosed on three sides by concrete block walls which are approximately eight feet high. The front of the unit is equipped with a six inch concrete berm and opens onto a concrete surface which surrounds the unit. High pressure water connections and hoses are located over the grates. The sumps are not drained and are reportedly pumped out when full. The concrete process area surrounding the unit is drained to the Combined Process/Storm Sewer System (SWMU 95), which in this area of the plant flows to the 16 Oil/Water Separators (SWMUs 84 - 86), and then to the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The unit was constructed in approximately 1950 and is currently in operation.

Waste Managed: Previously, water contaminated with carbon disulfide was managed in the unit. Currently, wash water containing residual oil and sludges is managed.

Release Controls: Three walls and surrounding concrete provide control for the overspray.

History of Releases: Dark staining indicating that several of the sumps have experienced some overflow was noted on the outer concrete berms of the sumps. An overflow weir knocked out of one sump berm also exhibited some staining indicating that flow out of the sump had occurred. However, all staining was observed to be confined to the concrete area. The bottoms of the sumps could not be inspected during the VSI; several of the

53. UNIT NAME: 8-C Crude Unit Drip Showers
 (continued)

 sumps contained standing liquids. No
 evidence of release was identified through
 review of the available file materials.

References: 369

55. UNIT NAME: Benzene Vapor Recovery System
(Photograph 55.1)

Unit Description: The unit is located at the 15-Plant Propylene Units in the central section of the facility. The unit consists of a benzene recovery system that was used when benzene was loaded into tanker trucks. There is no toluene recovery system due to its lower volatility. The benzene recovery system consisted of outer boots that surrounded the loading arms and adjoined the side of the tanker, thus enclosing the loading attachment. The vapors collected in the boot were pumped to a liquid extraction column in which the benzene was extracted into a gas oil. The gas oil was then returned to the benzene production process. The recovery unit consists of the above ground extraction column, piping and equipment, and an in-ground, grated concrete sump that is located near the base of the column. The sump is approximately four feet square in area and the depth could not be determined because the unit contained liquid at the time of the VSI.

Dates of Operation: The date of start-up of this unit is not known; however, it was likely constructed in 1965, at the same time as the BTX Production Plants (15 and 17). The system was taken out of operation within the last ten years.

Waste Managed: Benzene.

Release Controls: The unit is a closed system.

History of Releases: The inside of the in-ground concrete sump could not be inspected during the VSI. A strong odor was noted in the area of the unit during the VSI.

References: 138 and 369

56. UNIT NAME: Asphalt Plant Area
 (Photographs 56.1 - 56.5)

Unit Description: The unit is located in the central section of the facility on the northern bank of the Middle Creek Surface Drainage System (SWMU 96) at the intersection of Hewes Avenue and Middle Creek Road. The unit is an abandoned asphalt production plant that produced asphalt from the heavier fractions of crude oil. The plant was taken out of service in the early 1970s and much of the plant structures, including process tanks and storage areas remain in-place. Portions of the plant were demolished in the mid-1980s, however, heavy residue remains throughout most of the plant and wastes have been left in-place.

The plant covers an area approximately 200 feet (east - west) by 100 feet (north - south) and originally included eight large steel storage tanks in two east - west rows situated on circular concrete pads. The production system was located between the two rows of tanks. The production area was paved with concrete and had a grated, in-ground sump running down the middle of the area (east - west). The grated sump terminates at the western end of the plant by flowing into a square, concrete, in-ground sump. An overflow weir in the sump appeared to allow settling of solids before the sump discharged to a below-ground pipe, presumably part of the Combined Process/Storm Sewer System (SWMU 95). Parts of the production area were paved with concrete and encircled by a concrete wall approximately three feet high. A drain and sump system was used to collect liquids from the process area and separate out solids prior to discharge to the Combined Process/Storm Sewer System (SWMU 95) which flowed to the 1D Oil/Water Separator (SWMU 66) and then to the Middle Creek Surface Drainage System (SWMU 96).

At the time of the VSI, it was noted that some demolition activities have taken place. The four tanks in the southern row are still standing, although large entries have been cut into the steel walls. The four tanks in the northern row have been removed, and only the concrete pads remain. Remaining process equipment includes piping, pumps,

56. UNIT NAME: Asphalt Plant Area
(continued)

and other apparatus. At the time of the VSI the sump was observed to be full of dark, oily standing liquids and appeared to be in disrepair (Photograph 56.2). The settling portion of the sump was full of residues at the time of the VSI. At the eastern edge of the process area an additional sump was noted, but the purpose and operation of the sump was not clear. During the VSI, the process area was heavily stained and oily residues were noted on the remaining structures and equipment.

According to the facility, liquid wastes from the Asphalt Plant Area were reprocessed through the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58-60)). Emulsions were reportedly sent to a commercial TSD facility and solids were sent to an off-site commercial landfill.

Dates of Operation:

The asphalt plant was constructed in the 1920s or 1930s. The plant was taken out of operation in the early 1970s. Some preliminary demolition was conducted in the area in the mid-1980s.

Waste Managed:

Wastes managed at this unit include process residues, wastewater, tank cleaning residues, and separation residues along with the tanks and equipment used at the plant. Asphalts contain high molecular weight hydrocarbons called asphaltenes (soluble carbon disulfide) and aromatic hydrocarbons (referred to as volatile oils).

Release Controls:

Release controls included pavement on portions of the production area and use of drains and sumps to collect process wastewaters prior to discharge to the sewer system.

History of Releases:

During the VSI, heavy staining, oily residues, standing liquids, and sludges were noted throughout the plant both on concrete areas and on bare soils. The concrete surfaces, containment areas, sumps, and drains were noted to be in disrepair and partially demolished. The insides of drains, sumps, and the concrete surface of

56. UNIT NAME: Asphalt Plant Area
 (continued)

the production area were largely not visible due to heavy build up of residues and liquids. Sludges and residues filled the final sump in the drain system, and were also noted to cover the railings and area surrounding the sump. Tank cleaning residues were also noted just outside of the entryway cut into the side of one tank.

References: 369, 372

57. UNIT NAME: Clay Contact Plant Area
 (Photograph 57.1)

Unit Description:

The Clay Contact Plant Area is located in the eastern section of the refinery on the west side of Green Avenue and to the north of the 8-C Crude Unit, in the eastern section of the plant. This area is the location of the former Clay Contact Plant which was part of a naphthenic lubricating and specialty oils production process that operated at MHR from the 1940s until 1983. At this plant, clay was used to clean oxides and other contaminants from the lubricating and specialty oils that had been treated with sulfuric acid. The cleaned oils were returned to the process and the spent clay was sent to a vacuum filter press where residual oil was removed from the spent clay. Any oil that was removed was returned to the process. A vacuum filter press was used to remove residual oils from the spent clay prior to disposal, with the recovered oil being returned to the process and the spent clay transported by screw conveyor into steel, 30-yard containers.

Prior to 1979, the clay was shipped to off-site landfills for disposal. From 1979 until approximately 1983, the clay was taken to the SWF where it was mixed with sludges and slurries for treatment.

No information was available concerning the design and construction of this unit, except that the loading area was located at the northern end of the plant area. At the time of the VSI, the area was observed to be a gravel-covered parking lot. According to the facility representatives, at least two ground-water monitoring wells have been installed in the area of the Clay Contact Plant. However, the specific well locations could not be determined during the VSI and according to the facility representatives, no monitoring data are available.

The plant itself was demolished in about 1985. At the time of the VSI, the facility representatives could not provide any information on the condition of the plant or on the demolition activities including how residual products and wastes were handled, whether structures were cleaned before they

57. UNIT NAME: Clay Contact Plant Area
 (continued)

were demolished, and where the demolition debris and residual products and wastes were disposed.

Dates of Operation: The Clay Contact Plant was constructed in the 1940s and is estimated to have ceased operations in 1983 when production of lubricating oils at the plant stopped. According to the facility representatives, the Clay Contact Plant was demolished within a year or two after operations ceased.

Waste Managed: Approximately 30-cubic yards of spent clay from the Contact Plant (naphthenic lubes and specialty oils production) was generated per day in this unit. The clay was used to remove acids, caustics, sulfonates, water, and aromatics from specialty oils (Reference 324) and had a hydrocarbon content of approximately 30%.

Release Controls: Spent clay was managed in steel containers (similar to roll-off containers). No other controls were documented.

History of Releases: During the VSI, the area was observed to be covered with gravel. No staining or other evidence of release was noted. No evidence of release was identified in the available file material.

References: 10, 14, 15, 324, and 369

59. UNIT NAME: Slop Oil Tank 132
 (Photograph 59.1)

Unit Description: The unit is located in the southeast section of the facility, to the east of Hewes Avenue and to the south of the MHR rail lines. The unit is a 15,000 BBL (630,000 gallon) above-ground, welded-steel, fixed-roof cylindrical tank situated on a concrete pad. The area surrounding the tank is gravel-covered, and there is no containment area surrounding the tank. This tank receives slop oil from the Slop Oil Tank V-29 (SWMU 58) and from various locations throughout the facility including oil separated from wastewater in MHR Oil/Water Separators (SWMUs 63 - 68, 70 - 79, and 81 - 94), used oil generated throughout MHR (8-C Crude Unit Drip Showers - SWMU 53), residues from the bottoms of petroleum product containers, oil filtered from sludges and slurries in the Sludge Filter Press (SWMU 20) at the SWF, and liquid residues from product storage tank cleaning. In the tank, water and solids are separated from the slop oil through settling. The oil is sent to Slop Oil Tank 388 (SWMU 60). The water is discharged through the Combined Process/Storm Sewer System (SWMU 95) to the 16 Oil/Water Separators (SWMU 84 - 86), and then to the Middle Creek Surface Drainage System (SWMU 96). The solids are removed from the tank annually.

During the VSI, the base of the tank appeared to be deteriorating, with rust and stains noted around the perimeter of the tank. Parts of the base were not visible as they were blocked by associated piping.

Dates of Operation: The date of construction of the tank is not known. The tank is currently in operation.

Waste Managed: Slop oil from various sources around the facility and the water and solids are separated out of the slop oil in the tank.

Release Controls: The tank is steel and closed. No other release controls were identified for the unit.

History of Releases: No evidence of release was identified in the available file material. During the VSI, several small stains were noted at the base

59. UNIT NAME: Slop Oil Tank 132
(continued)

of the tank near tank valves. Portions of
the base could not be observed during the
VSI.

References: 221, 363, 368, 369, and 372

60. UNIT NAME: Slop Oil Tank 388
 (No Photograph)

Unit Description: The unit is located in the southeast section of the facility, to the east of Hewes Avenue and to the south of the MHR rail lines. The tank is a 80,900 BBL (about 3.4 million gallons) above-ground, welded-steel, fixed-roof cylindrical tank situated on a concrete pad. The tank receives slop oil from Slop Oil Tank 132 (SWMU 59). Water and solids are separated from the oil in Tank 132. The separated oil is then piped to refinery process units where it is used as an input.

This unit was identified subsequent to the VSI and therefore, the condition of the unit was not determined.

Dates of Operation: The date of construction of the tank is not known. The tank is currently in operation.

Waste Managed: Slop oil, from which water and solids have been separated, is managed in the tank.

Release Controls: The tank is steel and closed. No other release controls were identified for the unit.

History of Releases: No evidence of release was identified in the available file material. The unit was not observed during the VSI.

References: 221, 363, 368 and 369

61. UNIT NAME: Ballast Water Tank W-12
 (No Photograph)

Unit Description: The unit is located in the east section of the facility. The unit was identified after the VSI based on additional information provided by the facility. However, the facility representatives were not able to provide information on size or materials of construction. The unit receives waste ballast water that is pumped from the ballast tanks of tanker ships docked at MHR. Ballast water typically contains oils and residues. Through settling in the tank water, oil, and solids are separated. The water is discharged through the Combined Process/Storm Sewer System (SWMU 95) either directly to the Middle Creek Surface Drainage System (SWMU 96) or to the 16 Oil/Water Separators (SWMUs 84 - 86) and then to the Middle Creek Surface Drainage System (SWMU 96). The solids are cleaned out of the tank when necessary. The last cleaning was in 1983. The oil is returned to the MHR production units.

Dates of Operation: The date of construction of the tank is not known. The tank is currently in operation.

Waste Managed: Waste ballast water containing residues and oils.

Release Controls: No release controls have been identified for the tank.

History of Releases: No evidence of release was identified in the available file material. The unit was not observed during the VSI.

References: 368 and 369

62. UNIT NAME: Heat Exchanger Bundle Cleaning Area
(Photographs 62.1 - 62.2)

Unit Description: The Heat Exchanger Bundle Cleaning Area is located in the central section of the facility between the Middle Creek Surface Drainage System (SWMU 96) and the Maintenance Shop. The unit consists of a concrete pad which is approximately 200 feet (east - west) by 75 feet (north-south) in area. The pad is not bermed and is surrounded by bare soil on all sides. Single, steel rails run the length of the pad on the southern and northern edges. Grated, in-ground concrete sumps run along the southern and portions of the east and west edges of the area.

Heat exchanger bundles from throughout MHR are cleaned in the area. The tube bundles are placed horizontally on two roller stands and sprayed with high pressure water. There are grated, in-ground concrete sumps to collect wash water. Wash water that flows into the sumps then flows either directly to the adjacent Middle Creek Surface Drainage System (SWMU 96) or to the **Combined Process/Storm Sewer System (SWMU 95) on to the DELCORA wastewater treatment facility.** Residues that settle out in the sumps are considered EPA Hazardous Waste Number K050, Heat Exchanger Bundle Cleaning Sludge. The sludge is periodically removed and taken to the SWF for treatment.

During the VSI, dark, oily staining was noted throughout the area, both on the concrete and on the soil surrounding the pad, particularly on the south and east sides of the pad. The sumps contained varying quantities of sludge and several of the sumps appeared to be full.

Dates of Operation: This unit has been in operation since before 1950. The unit is currently in operation.

Waste Managed: Heat exchanger bundles are cleaned in the area using high pressure water. The wash water managed in the unit contains sludges and scale that build up in the exchanger tubes. The sludge that is collected in the area sumps is considered to be EPA Hazardous Waste Number K050, Heat Exchanger Bundle Cleaning Sludge. In the past, heat

62. UNIT NAME: Heat Exchanger Bundle Cleaning Area
 (continued)

 exchanger bundles were cleaned in this area using chemicals, most likely strong acids (Reference 10).

Release Controls: The area is on a concrete pad with sumps to collect wash water. The area is not bermed.

History of Releases: During the VSI, dark, oily staining was noted on the concrete pad and on the soil surrounding the pad, particularly on the south and east sides of the pad.

References: 10, 369 and 372

63. UNIT NAME: 1A Oil/Water Separator
 (Photographs 63.1 - 63.4)

Unit Description: The 1A Oil/Water Separator is located in the northern section of the facility, at the southern perimeter of the crude and distillates storage tank farm and just to the north of the Washington - Baltimore - Philadelphia Railroad Line. The unit is an American Petroleum Institute (API) oil/water separator used to separate oil and solids from wastewater generated in the northern tank farm areas. The 1A Oil/Water Separator consists of an in-ground concrete basin that is approximately 90 feet by 20 feet in area. The depth is estimated to be 20 feet. The length of the unit is divided into two separation sections, or pockets, through which the water flows in series. The unit is surrounded by gravel covered soil and approximately six-foot high gravel-covered soil berms. Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlet on the north end to the outflow pump on the southern end. The oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUS 58 - 60)). The solids that settle in the unit are removed approximately once every 14 months and trucked to the SWF for treatment (SWMUS 1 - 21). The treated wastewater is piped under the rail line and then through the Combined Process/Storm Sewer System (SWMU 95) to the head (northeastern terminus) of the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The separator was constructed in the 1940s or 1950s and is currently in operation.

Waste Managed: Wastewater managed in this unit consists largely of precipitation collected in tank containment areas, water that settles to the bottoms of storage tanks and is removed through discharge valves located near the tank bases, and condensate from steam heating systems for storage tanks. The products stored in the area, which are likely contaminants in the water, include crude oil and petroleum distillates.

Release Controls: The unit overflows to the Middle Creek Surface Drainage System (SWMU 96).

63. UNIT NAME: 1A Oil/Water Separator
 (continued)

History of Releases: During the VSI, heavy dark oily staining was noted to cover the bottom of the containment area around the unit to a depth of approximately two feet above the top of the unit, indicating that oily water had recently overflowed from the unit (a major precipitation event had occurred several weeks before the VSI). The tops and outsides of the concrete walls of the unit were darkly stained, and several areas adjacent to the unit (gravel covered) appeared to be more heavily stained than the areas clearly stained in the recent storm (Photograph 63.1). The inside and bottom of the unit could not be inspected during the VSI.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

64. UNIT NAME: 1B Oil/Water Separator
67. UNIT NAME: 1E Oil/Water Separator
(No Photograph)

Unit Description: These units were identified by the fact that the existing No. 1 separators (separators managing largely runoff from tank farms) are identified by letters in alphabetical order from northeast to southwest (e.g., 1A, 1C, 1D, and 1F), but that there are currently no 1B or 1E separators. Facility representatives indicated that there probably were 1B and 1E separators in the past, and hypothesized that they may have been API-type separators located in Middle Creek. However, no further information was obtained about these units.

Dates of Operation: The dates of operation of these units are unknown. The units are not currently in operation.

Waste Managed: It is assumed that the units managed oily wastewater.

Release Controls: The units likely discharged to the Middle Creek Surface Drainage System (SWMU 96).

History of Releases: No evidence of release were identified in the available file material. The units were not observed during the VSI.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

65. UNIT NAME: 1C Oil/Water Separator
 (Photographs 65.1 - 65.4)

Unit Description: The 1C Oil/Water Separator is located in the central eastern section of the facility, to the east of Hewes Avenue and on the western bank of the Middle Creek Surface Drainage System (SWMU 96). The unit is an American Petroleum Institute (API) oil/water separator used to separate oil and solids from wastewater generated in the Hewes Avenue tank farm areas. The 1C Oil/Water Separator consists of an in-ground concrete basin that is approximately 90 feet by 20 feet in area. The depth of the unit is estimated to be 20 feet. The length of the unit is divided into two separation sections, or pockets, through which the water flows in series. The oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The solids that settle in the unit are removed approximately once every 18 months and trucked to the SWF for treatment (SWMUs 1 - 21). The treated wastewater is discharged directly to the adjacent Middle Creek Surface Drainage System (SWMU 96). Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlet on the north end to the outlet on the southern end. The unit is surrounded by gravel covered soil and the Middle Creek Surface Drainage System (SWMU 96), which is within 15 feet of the unit on the eastern side. During the VSI, one half-pipe skimmer in the unit was improperly adjusted such that no oil was being removed (Photograph 65.3).

Dates of Operation: The separator was constructed in the 1940s or 1950s and is currently in operation.

Waste Managed: Wastewater managed in this unit consists largely of precipitation collected in tank containment areas, water that settles to the bottoms of storage tanks and is removed through discharge valves located near the tank bases, and condensate from steam heating systems for storage tanks. In the area that is drained to this separator, most of the tanks are used to store bunker fuel. Bunker fuel is thus a likely contaminant in the wastewater.

65. UNIT NAME: 1C Oil/Water Separator
 (continued)

Release Controls: The units overflows to the Middle Creek
 Surface Drainage System (SWMU 96). There
 are no other release controls for the unit.

History of Releases: During the VSI, dark, oily staining was
 noted on the gravel surrounding the
 separator, particularly on the east side,
 indicating that the oily water has
 overflowed the separator in the recent past.
 In some areas, the staining extended to the
 edge of the adjacent Middle Creek Surface
 Drainage System (SWMU 96) (Photograph 65.4).
 The tops of the concrete sides of the unit
 and the lower portion of the railings
 surrounding the unit were extremely heavily
 stained. The gravel surrounding the unit
 appeared to be relatively new and to be
 stained less than the edges of the unit.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188,
 191, 207, 214, 222, 224, 242, 321, 349, 363,
 and 369

66. UNIT NAME: 1D Oil/Water Separator
 (Photographs 66.1 - 66.4)

Unit Description: The 1D Oil/Water Separator is located in the central eastern section of the facility, between Fifth Street and the Middle Creek Surface Drainage System (SWMU 96). The unit is an American Petroleum Institute (API) oil/water separator used to separate oil and solids from wastewater generated in the Asphalt Plant Area (SWMU 56). The 1D Oil/Water Separator consists of an in-ground concrete basin that is approximately 90 feet by 20 feet in area. The depth of the unit is estimated to be 20 feet. The unit is covered with mesh covers and is heated by steam lines located on the bottom of the unit. The unit is surrounded by a concrete surface on the east, gravel covered soil on the west and north, and the Middle Creek Surface Drainage System (SWMU 96), which is adjacent to the unit on the southern side. There is little influent wastewater into the unit, the majority of the waste managed is sludge-like residues from cleaning product storage tanks which are trucked to the separator and pumped into the unit through a trash rack. The sludges are heated to encourage separation. Oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The sludges remaining in the unit are periodically pumped into vacuum trucks and transferred to the SWF for treatment (SWMUs 1 - 21). Separated wastewater is discharged directly to the adjacent Middle Creek Surface Drainage System (SWMU 96), although very little water is generated in this separator.

Dates of Operation: The separator was constructed in the 1940s or 1950s and is currently in operation.

Waste Managed: Wastes managed in this unit include sludges from tank cleaning (tank bottoms containing scale, rust, and crude oil and hydrocarbon product residues) and wastewater from the Asphalt Plant Area (SWMU 56). Although the majority of products stored at MHR are currently unleaded, in the past leaded tank bottoms would have been managed in this unit.

66. UNIT NAME: 1D Oil/Water Separator
 (continued)

Release Controls: The unit is covered to minimize releases to air. There are steel plates surrounding the south end of the unit to control splashing as sludges are dumped into the unit.

History of Releases: During the VSI, dark, oily staining was noted on the gravel and concrete surrounding the separator, particularly on the east side and in the area of the slop oil pump (southeast side). The concrete and the top of the concrete wall of the unit on the west side were heavily stained and oily. The valve box that drains to the Middle Creek Surface Drainage System (SWMU 96) was full of a dark liquid, heavily stained, and had a dark sludge-like material coating the sides (the valve was closed at the time of the VSI).

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

68. UNIT NAME: 1F Oil/Water Separator
 (Photographs 68.1 - 68.2)

Unit Description: The 1F Oil/Water Separator is located in the central section of the facility, between the Maintenance Shop and the Middle Creek Surface Drainage System (SWMU 96). The unit is a corrugated plate oil/water separator located below-ground which is used to separate oil and solids from wastewater generated in the central tank farm areas of MHR. The top of the unit, which is covered with steel plates, is approximately 15 by eight feet in area. It is estimated that the unit extends eight feet below the land surface. The top of the unit is surrounded by a paved area. Wastewater flows into the separator from the 1F Oil/Water Separator Feed Trench (SWMU 69). Oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The sludges remaining in the unit are pumped from the unit approximately once a year and transferred to the SWF for treatment (SWMUs 1 - 21). Separated wastewater is discharged directly to the adjacent Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The 1F Oil/Water Separator was constructed in the early 1970s and is currently in operation.

Waste Managed: The unit manages wastewaters containing oil and gasoline. Sources of wastewater include water from tank containment areas and water that settles to the bottoms of storage tanks and condensate from steam heating systems for storage tanks. This unit also manages contaminated wash water and spills from the Maintenance Shop.

Release Controls: The unit is covered and the surface of the unit is surrounded by a paved area.

History of Releases: No evidence of releases was identified in the available file material. During the VSI, the unit was observed to be filled with liquid and the integrity could not be determined. Oily sludges were observed around the unit, but appeared to be confined to the paved area.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

69. UNIT NAME: 1F Oil/Water Separator Feed Trench
 (Photographs 69.1 - 69.7)

Unit Description: The 1F Separator Feed Trench is located in the central section of the facility, between the 1F Oil/Water Separator (SWMU 68) and the Middle Creek Surface Drainage System (SWMU 96). The approximately 50-foot portion of the trench near the 1F Separator is a concrete, open topped trench which receives wastewater from the Combined Process/Storm Sewer System (SWMU 95) and from which wastewater flows into the 1F Oil/Water Separator through a submerged pipe (Photographs 69.1 and 69.7). The portion of the trench to the east of the 1F Separator is filled with gravel, which in the western section, supports a corrugated steel pipe which transfers the wastewater. One six-foot section of this portion of the trench is not gravel filled, however, and at the time of the VSI, contained a dark oily liquid with an oily residue floating on top. A pipe was visible leading into and out of the open section on each side, through the gravel fill. Evidence of the gravel filled portion of the trench extends approximately one hundred and fifty yards toward the west, between the Heat Exchanger Bundle Cleaning Area (SWMU 62) and Fifth Street (Photograph 69.4), although the walls of the trench appear to have been destroyed in some areas.

Dates of Operation: The date of construction of the unit is not known, although it is likely that it was constructed as part of the original sewer system for the facility.

Waste Managed: Currently, the unit manages wastewaters containing oil and gasoline. Sources of wastewater include water from tank containment areas and water that settles to the bottoms of storage tanks and condensate from steam heating systems for storage tanks. This unit also manages contaminated wash water and spills from the Maintenance Shop. It is not known what wastes were managed in the unit prior to the current operations of the unit (i.e., before it was filled with gravel).

Release Controls: No release controls were identified for the unit.

69. UNIT NAME: 1F Oil/Water Separator Feed Trench
 (continued)

History of Releases: During the VSI, dark oily staining was noted on the top and outsides of the concrete sides of the open section of the gravel-filled portion of the trench (Photographs 69.5 and 69.6). An overflow lip appeared to have been knocked out of the concrete on the Middle Creek Surface Drainage System (SWMU 96) side. The soils on both sides of this section were stained heavily, and the stains extended to the edge of the Middle Creek Surface Drainage System (SWMU 96) on the south side. The sides, top, and outsides of the concrete walls of the trench in the portion adjacent to and feeding the 1F Oil/Water Separator were also covered with dark staining. A desiccated sludge-like residue was noted on the soil on the north side of this area. The south side is adjacent to the Middle Creek Surface Drainage System (SWMU 96). In addition, oily staining was noted in low areas near the western extension of the gravel filled trench (next to the Heat Exchanger Bundle Cleaning Area (SWMU 62)).

References: 369

70. UNIT NAME: 9A Oil/Water Separator
 71. UNIT NAME: 9B Oil/Water Separator
 72. UNIT NAME: 9C Oil/Water Separator
 73. UNIT NAME: 9D Oil/Water Separator
 74. UNIT NAME: 9E Oil/Water Separator
 75. UNIT NAME: 9F Oil/Water Separator
 76. UNIT NAME: 14A Oil/Water Separator
 77. UNIT NAME: 14B Oil/Water Separator
 78. UNIT NAME: 14C Oil/Water Separator
 79. UNIT NAME: 14D Oil/Water Separator
 (Photographs 70.1 - 70.9, 71.1 - 71.9,
 72.1 - 72.9, 73.1 - 73.9, 74.1 - 74.9,
 75.1 - 75.9, 76.1 - 76.9, 77.1 - 77.9,
 78.1 - 78.9, 79.1 - 79.9)

Unit Description: The 9 and 14 Oil/Water Separators are located adjacent to one another in the central portion of the facility, to the west of the 18 Plant and to the south of the rail lines and the Middle Creek Surface Drainage System (SWMU 96). These units are parallel API oil/water separators that were used prior to 1984 to separate oil and solids from wastewater generated in the 9 and 14 Plants, both of which are out of operation. The oil separated in the unit was pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators were reportedly removed periodically. The 9 Plant separators (six separators on the west side of the cluster) were reportedly cleaned in 1984, at the time the units were taken out of operation. The treated wastewater was discharged through a corrugated pipeline that is part of the Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators (SWMU 80). The pipe is believed to have discharged directly to the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The separators are estimated to have been constructed in the early 1940s. The separators were taken out of operation in 1984 when the plants feeding them were taken out of operation.

Waste Managed: Wastewater managed in these units consisted of process wastewater generated in the 9 and 14 Plant production processes. "Mercury-made" oil was produced at the 9 Plant.

Release Controls: No release controls were identified for these units.

70. UNIT NAME: 9A Oil/Water Separator
71. UNIT NAME: 9B Oil/Water Separator
72. UNIT NAME: 9C Oil/Water Separator
73. UNIT NAME: 9D Oil/Water Separator
74. UNIT NAME: 9E Oil/Water Separator
75. UNIT NAME: 9F Oil/Water Separator
76. UNIT NAME: 14A Oil/Water Separator
77. UNIT NAME: 14B Oil/Water Separator
78. UNIT NAME: 14C Oil/Water Separator
79. UNIT NAME: 14D Oil/Water Separator
(continued)

History of Releases: During the VSI, dark, oily staining was noted on the soil surrounding the separators in several locations, particularly on the east side (Photographs 70.4 - 79.4). Areas under and surrounding piping, pumps, equipment, sumps, and small vaults associated with the separators were stained with dark oily materials (Photographs 70.5 - 79.5). Areas of the demolished 9 separators that were not filled with construction rubble were noted to contain dark oily liquids that have heavily stained the surrounding rubble and concrete (Photographs 70.6 - 79.6 and 70.7 - 79.7). Some portions of the external walls in the liquid filled area had been demolished. Associated sumps and vaults were filled with liquids, sludges (capable of supporting small stones), and residues (Photographs 70.5 - 79.5, 70.8 - 79.8, and 70.9 - 79.9).

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

80. UNIT NAME: Discharge Pipe and Excavation at 9 and 14
 Oil/Water Separators
 (Photograph 80.1 and 80.2)

Unit Description: The Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators consists of an excavation and an approximately 200-yard section of 4-foot diameter, corrugated pipe that transferred effluent water from the 9 and 14 Oil/Water Separators (SWMUs 70-79), westward along the rail lines, and then discharged to the Middle Creek Surface Drainage System (SWMU 96). The pipe line is still in place but has not been in operation since 1984, when the 9 and 14 Oil/Water Separators (SWMUS 70-79) were taken out of operation. The pipe is above-ground and situated on concrete saddles for most of its length, however it runs underground under a rail spur just to the west of the 9 and 14 Oil/Water Separators (SWMUs 70-79) and then under the rail lines to the Middle Creek Surface Drainage System (SWMU 96) near the 16 Oil/Water Separators (SWMUs 84-86). The excavation is located in the area of the rail spur below-ground section of the pipe. The excavation is approximately four-foot square in area and is shored with wooden planks. The excavation is approximately six feet deep and is full of water.

Dates of Operation: The Corrugated Pipe is estimated to have been constructed in the early 1940s, and was taken out of operation (but not removed) in 1984. The date of construction of the excavation is not known.

Waste Managed: The pipe managed wastewater discharged from the 9 and 14 Oil/Water Separators (SWMUs 70-79). This wastewater was contaminated with oil and gasoline.

Release Controls: There are no known release controls for the unit.

History of Releases: Facility representatives reported that when the corrugated pipe was in operation, there were continuous problems with leaks from the pipe. During the VSI, dark oily staining was noted on the soil beneath and around the pipe along its entire length. The excavation appeared to be located over the underground portion of the pipe that tunnels under the rail spur. The soil in the area surrounding the excavation was covered with

80. UNIT NAME: Discharge Pipe and Excavation at 9 and 14
 Oil/Water Separators
 (continued)

 dark oily staining and oily residues. The
 excavation was full of a standing dark oily
 liquid. The shoring around the excavation
 was also heavily stained.

References: 369

81. UNIT NAME: 10A Oil/Water Separator
82. UNIT NAME: 10B Oil/Water Separator
(Photographs 81.1 - 81.6, 82.1 - 82.6)

Unit Description:

The 10 Oil\Water Separators are located to the south of the 10-4 Plant in the northeastern section of the facility. Operations conducted in these areas include catalytic cracking of gas oil and reduced crude to produce a gas/gasoline mixture and oils. These adjacent units are parallel API oil/water separators used to separate oil and solids from wastewater generated in the 10 Plants. The units also include the piping, pumps, and equipment used to transfer the separated oil from the units. The oil separated in the unit is piped to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators are removed every six months. The two 10 Oil/Water Separators (A and B) together form an in-ground concrete basin that is approximately 100 feet by 35 feet in area. The depth of the basin is estimated to be 20 feet. The basin is separated into the two separators along the long axis by a concrete wall. Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlets on the north end to the discharge reservoir on the southern end. A pump house located to the northwest of the units houses piping and equipment used to pump the separated oil to the slop oil system. The floor of the pump house is gravel-covered soil. An on-ground vertical cylindrical tank located to the northwest of the pump house was used in the past to accumulate and store the separated oil. The tank is no longer in use. The separated water is discharged directly to the Middle Creek Surface Drainage System (SWMU 96). The units are surrounded by gravel covered soil on all sides. The separators are covered with steel plate covers to minimize releases to air. Emissions from the units are permitted under PADER permit number 23-312-052.

Dates of Operation:

It is estimated that the 10 Oil/Water Separators were constructed in the late 1950s. The steel covers were added in 1980 or 1981. The units are currently in operation.

81,82. UNIT NAME: 10 Oil/Water Separators (A and B)
(continued)

Waste Managed: These units manage wastewater generated in the 10 Plant process areas.

The influent wastewater contains greater than 200 pounds per minute of volatile organic constituents (PADER requires covers for units having volatile loading above 200 lbs/minute).

Release Controls: The separators are covered. No other release controls were identified.

History of Releases: During the VSI, dark oily staining was noted on the gravel-covered soil surrounding the units. Areas of particularly heavy staining include the area surrounding the final discharge, the area surrounding the oil sump on the west side of the unit, and in and around the oil pump house.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

83. UNIT NAME: 12A Oil/Water Separator
 (Photographs 83.1 - 83.2)

Unit Description: The 12A Oil/Water Separator is located in the central eastern section of the facility, to the south of the 12-3 Crude Unit. The unit is a corrugated plate oil/water separator used to separate oil and solids from wastewater generated in the 12 Plant where crude oil is desalted and distilled to produce lubricating oils and residual fuels. Oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The sludges generated in the unit are pumped from the unit approximately once a year and transferred to the SWF for treatment (SWMUs 1 - 21). Separated wastewater is discharged to the Middle Creek Surface Drainage System (SWMU 96) which flows to the west of the unit. The 12A Oil/Water Separator is an in-ground corrugated plate separator. From the surface the unit appears to consist of two separator components and a discharge reservoir. The tops of each component, which are covered with steel plates, are approximately 20 by eight feet in area. It is estimated that the unit components extend ten feet below the land surface. The top of the unit is surrounded by gravel-covered soil.

Dates of Operation: The separator was constructed in the early 1970s and is currently in operation.

Waste Managed: Wastewater managed includes process wastewater containing petroleum distillates, cooling tower blowdown, which may contain by-product salts and chlorine (past) or bromine (current); desalter water, which may contain salt, phenols, and hydrogen sulfide; and water used in equipment cleaning.

Release Controls: The unit is covered.

History of Releases: No evidence of releases was identified in the available file material. During the VSI, minor staining around the perimeter of the unit was noted, though this appeared to be rust. The integrity of the unit could not be assessed during the VSI as the unit contained liquids.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

84. UNIT NAME: 16A Oil/Water Separator
85. UNIT NAME: 16B Oil/Water Separator
86. UNIT NAME: 16C Oil/Water Separator
(Photographs 84.1 - 84.4, 85.1 - 85.4,
86.1 - 86.4)

Unit Description: The 16 Oil\Water Separators are located in the south central section of the facility, on the southeastern corner of the intersection of Blueball Avenue and the Middle Creek Surface Drainage System (SWMU 96). These adjacent units are parallel API oil/water separators used to separate oil and solids from wastewater generated in the southeastern part of the facility. This area includes the 8-C Crude Unit and the 18 Plant. The oil separated in the unit is piped to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators are removed every six months. The three 16 Oil/Water Separators (A, B, and C) together form an in-ground concrete basin that is approximately 100 feet by 50 feet in area. The depth of the basin is estimated to be 20 feet. The basin is separated into the three separators along the long axis by concrete walls. Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlets on the south end to the discharge reservoir on the northern end. The units also include oil and sludge sumps in which oil and sludge are collected and from which oils and sludge are removed (oil is pumped continuously, sludge pumped periodically to trucks). Piping and equipment used to pump the separated oil to the slop oil system (SWMUs 58-60) is located in and to the south of a brick building on the southeast side of the units. The separated water is discharged directly to the Middle Creek Surface Drainage System (SWMU 96) which is located just to the north of the units. The units are surrounded by gravel covered soil on all sides.

Dates of Operation: The 16 Oil/Water Separators were constructed in the 1940s or 1950s and are currently in operation.

84 - 86. UNIT NAME: 16 Oil/Water Separators (A, B, and C)
(continued)

Waste Managed: These units manage wastewater generated in the southeastern portion of the facility. This includes wastewater generated in the 8-C Crude Unit and the 18 Plant. 8-C Plant wastewater includes cooling tower blowdown, which may contain by-product salts and chlorine (past) or bromine (current); desalter water, which may contain salt, phenols, and hydrogen sulfide; water used in equipment cleaning, and other process water. At the 18 Plant, sulfuric acid is used to treat sodium napthenate from the 8-C Plant to produce napthenic acids which are used elsewhere in the plant as feedstocks.

Release Controls: No release controls were identified for these units.

History of Releases: During the VSI, dark oily staining was noted on the tops and sides of the concrete walls of the units and on the gravel-covered soil surrounding the units in locations. The gravel-covered soil area under and surrounding the oil pump and piping at the southeast corner of the units was saturated with oil. An area of gravel-covered soil approximately 50 by 20 feet in area between the pump house and the rail line to the north of the units was also stained with an oily substance.

References: 364, 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

87. UNIT NAME: 15A Oil/Water Separator
 88. UNIT NAME: 15B Oil/Water Separator
 89. UNIT NAME: 15C Oil/Water Separator
 90. UNIT NAME: 15D Oil/Water Separator
 91. UNIT NAME: 15E Oil/Water Separator
 92. UNIT NAME: 15F Oil/Water Separator
 93. UNIT NAME: 15G Oil/Water Separator
 94. UNIT NAME: 15H Oil/Water Separator
 (Photographs 87.1 - 87.4, 88.1 - 88.4,
 89.1 - 89.4, 90.1 - 90.4, 91.1 - 91.4,
 92.1 - 92.4, 93.1 - 93.4, 94.1 - 94.4)

Unit Description: The 15 Oil\Water Separators are located in the southwestern section of the facility, to the west of the Solid Waste Facility and to the northwest of the dam at the terminus of the Middle Creek Surface Drainage System (SWMU 96). The 15A Oil/Water Separator (east unit) manages wastewater generated in the 15 Plants. The unit manage wastewaters from 15 Plant which includes crude distillation, gas/gasoline separation, and production of benzene and xylene from toluene through disproportionation. The 15B Separator manages wastewater generated in the 17 Plants. Processes conducted at the 17 Plants include catalytic reforming (production of inputs for production of gasoline, jet fuel, kerosene, and petrochemicals) and separation of petrochemicals (benzene, toluene, xylene). The 15C - H Separators manage wastewater pumped from the Middle Creek Surface Drainage System (SWMU 96) neutralization basin. The wastewater consists of the combined effluent from all of the other MHR oil/water separators and other wastewater discharged directly to the Middle Creek Surface Drainage System (SWMU 96). All wastewater generated at MHR is collected in the Middle Creek Surface Drainage System (SWMU 96) basin and managed through these separators, except non-contact compressor cooling water that is discharged to the York and Elliot Bypasses under an NPDES permit.

These adjacent units are parallel API oil/water separators used to separate oil and solids from wastewater pumped from the Middle Creek Surface Drainage System (SWMU 96) (Separators C - H), from the 15 Plant (Separator A), and from the 17 Plant (Separator B). The oil separated in the

87. UNIT NAME: 15A Oil/Water Separator
 88. UNIT NAME: 15B Oil/Water Separator
 89. UNIT NAME: 15C Oil/Water Separator
 90. UNIT NAME: 15D Oil/Water Separator
 91. UNIT NAME: 15E Oil/Water Separator
 92. UNIT NAME: 15F Oil/Water Separator
 93. UNIT NAME: 15G Oil/Water Separator
 94. UNIT NAME: 15H Oil/Water Separator

(continued)

units is transferred to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators are removed every six months. The separated water is pumped through pipelines to the DELCORA wastewater treatment plant in Chester, PA, which, after secondary biological treatment, discharges the water into the Delaware River. The eight 15 Oil/Water Separators together form an in-ground concrete basin that is approximately 10,000 square feet in area. The depth of the basin is estimated to be 20 feet. The basin is divided into the eight separators along the north - south axis by concrete walls. Each separator is divided in half to form two separator pockets. Oil is retained in the first (northern) pockets by overflow-underflow weirs and is manually skimmed and pumped into tanker trucks, which transport the oil to Slop Oil Tank V-29 (SWMU 58). The separated water is pumped from a discharge reservoir at the north end of the units. The area surrounding the units is asphalt-paved on the west, north, and east sides and is gravel-covered soil on the south side. Separators A and B (east side separators) are covered with steel covers because the influent wastewater to the 15A and B separators contains greater than 200 pounds per minute of volatile organic constituents (PADER requires covers for units having volatile loading above 200 lbs/minute). The remaining separators are uncovered.

Dates of Operation:

The 15 Oil/Water Separators were constructed in the 1940s or 1950s and are currently in operation.

Waste Managed:

The 15A and B separators manage process wastewater contaminated with residues from crude distillates, gasoline, benzene, xylene, jet fuel, kerosene, and petrochemicals. The 15C - H Separators

87. UNIT NAME: 15A Oil/Water Separator
88. UNIT NAME: 15B Oil/Water Separator
89. UNIT NAME: 15C Oil/Water Separator
90. UNIT NAME: 15D Oil/Water Separator
91. UNIT NAME: 15E Oil/Water Separator
92. UNIT NAME: 15F Oil/Water Separator
93. UNIT NAME: 15G Oil/Water Separator
94. UNIT NAME: 15H Oil/Water Separator
(continued)

manage wastewater pumped from the Middle Creek Surface Drainage System (SWMU 96) neutralization basin which contains oils, and petroleum sludges.

Release Controls: The A and B Separators are covered. No release controls were identified for the other units.

History of Releases: No evidence of release was identified in the available file material. During the VSI, no evidence of releases from the units was identified.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

95. UNIT NAME: Combined Process/Storm Sewer System
 (Photographs 95.1 - 95.10)

Unit Description: The Combined Process/Storm Sewer System is an underground piping system located throughout the facility through which wastewater is transported from all parts of the refinery to MHR oil/water separators (SWMUs 63 - 68, 70 - 79, 81 - 94) and to the Middle Creek Surface Drainage System (SWMU 96). Process wastewater is piped directly into the system. Storm water is collected in sumps which drain into the system (particularly in tank farm areas). Grated sumps located throughout the facility drain storm water (in non-process areas) and both storm water and other wastewater generated in process operations (in process areas) into the system. The materials of construction of the system vary throughout the facility, depending on the materials used at the time of construction. It is likely that corrugated, terra cotta, concrete, and other types of pipe are used in various areas. The various pipes in the system discharge into oil/water separators or directly into the Middle Creek Surface Drainage System (SWMU 96). Some sewer system piping transfers wastewater from oil/water separators to the Middle Creek Surface Drainage System (SWMU 96) (1A and 12A separators, SWMUs 63 and 83).

Dates of Operation: The exact dates of construction for the Combined Process/Storm Sewer System can not be identified. It is likely that the earliest portions were constructed as the refinery was first constructed in the early 1900s. New portions of the system were constructed as the various MHR production units were constructed (to manage wastewater produced by these units) and as new areas of the refinery were developed (to manage storm water collected in these areas). However, over the past 90 years, many parts of the system have been taken out of service, reconstructed, or replaced. Records of such construction have not been consistently maintained over time.

Waste Managed: The Combined Process/Storm Sewer System manages process wastewater and storm water generated throughout the MHR. These waste waters are contaminated or potentially contaminated with hazardous wastes and hazardous constituents.

95. UNIT NAME: Combined Process/Storm Sewer System
 (continued)

Release Controls: The MHR oil/water separators (SWMUs 63 - 68, 70 - 79, 81 - 86) control releases of oils and solids from the Combined Process/Sewer System to the Middle Creek Surface Drainage System (SWMU 96). No other release controls for this unit were identified.

History of Releases: Numerous releases through oil/water separators were documented in the files (see SWMUs 35 - 60). Reference 321 documents a release of ten barrels of slop oil and wax into the Delaware River from a 24-inch sewer line, and several releases of oils into 66 and 24-inch lines.

During the VSI, evidence of releases from the Combined Process/Storm Sewer System caused by backups and overflows through grated drains was observed. Evidence observed included areas of stained soil surrounding surface drains. The sewer piping system was not observed during the VSI due to its underground location.

References: 111, 321, 349, 363, 369

96. UNIT NAME: Middle Creek Surface Drainage System
 (Photographs 96.1 - 96.12)

Unit Description: The Middle Creek Surface Drainage System begins at a point to the north of the 10 Oil/Water Separators (SWMUs 81 and 82) and extends southeast (parallel to Hewes Avenue) through the eastern portion of the facility to a point just south of Middle Creek Road. From this point the unit extends southwest to the western boundary of the facility, paralleling Middle Creek Road. The unit then trends southeast along the facility boundary until it discharges into the Delaware River. The Middle Creek Surface Drainage System is an unlined impoundment into which all wastewater generated at the MHR is discharged. Currently, the wastewater is stored to allow control of the flow rate of wastewater pumped from the unit and neutralized to control the pH. The wastewater is pumped from the unit to the DELCORA wastewater treatment facility (after treatment in the 15C - H Oil/Water Separators (SWMUs 89 - 94)).

The system that is now the Middle Creek Surface Drainage System first consisted of the natural drainage ways that flowed through the MHR area into which wastewater from MHR was discharged. The natural drainage system, which consisted of Walker's Run (north - south in the eastern portion of the facility) and Middle Creek (east - west in the southern portion of the facility), flowed directly into the Delaware River, likely somewhere in the area that now is Phillips Island (SWMU 27).

In 1968, an interceptor dam was constructed across Middle Creek at a location to the north of Impoundment Tank T-101 (SWMU 32). The dam retains the water discharged into the Middle Creek Surface Drainage System within the banks of the (previously) natural streams and prevents its discharge to the Delaware River. The area immediately above the dam has been widened to create a storage basin. Reference 321 indicates that the basin is capable of containing spills of up to 10,000 barrels of oil. Wastewater is pumped from the basin to the 15C - H Oil/Water Separators (SWMUs 89 - 94) and subsequently to the DELCORA wastewater treatment facility in Chester, PA. Water is

96. UNIT NAME: Middle Creek Surface Drainage System
 (continued)

also transferred back and forth between the basin and Impoundment Tank T-101, which provides additional wastewater storage capacity. The wastewater stored in the basin is neutralized (to maintain the pH between 6 and 8) using a system of mixers and an automatic valve that adds caustic or acid in response to automatic pH monitors.

The Middle Creek Surface Drainage System is unlined and is situated in the natural depressions of the previous streams. The entire length of the Middle Creek Surface Drainage System above the interceptor dam basin is approximately one half mile long and ranges in width from several feet to approximately 30 feet. The depth is estimated to range from one to ten feet. The basin portion of the drainage system, situated behind (to the east of) the interceptor dam, is approximately 70 feet at the widest point and is estimated to be up to 25 feet deep.

Addition of surface water to the Middle Creek Surface Drainage System from non-refinery areas has been eliminated through a system of underground bypass sewers that transfer storm water from the portion of the drainage basin above MHR (largely residential and light business areas) directly to the Delaware. However, since the system is unlined and is situated in natural stream channels in an area of shallow water table, addition of ground water to the unit (or recharge to ground water) has not been eliminated.

Dates of Operation:

Natural surface drainageways at MHR have been used to dispose of wastewater from the plant since the location was first used for refinery operations, i.e., since the early 1900s. The specific date when each portion of the current system was first used to manage wastes is not known. The Middle Creek Surface Drainage System is currently

96. UNIT NAME: Middle Creek Surface Drainage System
(continued)

in use. The interceptor dam, which currently forms the Middle Creek Surface Drainage System neutralization basin, was constructed in 1968 and is currently in operation.

Waste Managed: The Middle Creek Surface Drainage System manages process wastewater and storm water generated throughout the MHR. The wastewater is either discharged directly into the unit, or is treated in MHR oil/water separators (SWMUs 63 - 68, 70 - 79, 81 - 86) prior to discharge into the unit.

Release Controls: The interceptor dam controls releases of contaminated water from the Middle Creek Surface Drainage System to the Delaware River (since 1968). Impoundment Tank T-101 provides storage capacity to control releases to the Delaware River and to the DELCORA POTW. The neutralization system controls the pH of water discharged to the 15 C - H Oil/Water Separators (SWMUs 89 - 94) and then to the DELCORA POTW such that it remains between 6 and 8. The 15 C - H Oil/Water Separator (SWMUs 89 - 94) control releases of oil and solids to the DELCORA POTW.

History of Releases: Numerous releases of oils and other contaminants to the Delaware River through the interceptor dam were documented in the files (References 131, 144, 321, 322).

There are numerous incidents of releases of hydrocarbons from oil-water separators to the Middle Creek Surface Drainage System and to the Delaware River documented throughout the file material. In 1981, a study of the wastewater treatment system concluded that the separators were "contributing considerable quantities of free oil to the wastewater stream." As a result of numerous violations, PADER issued MHR several Consent Orders and Agreements (COAs) requiring that MHR upgrade its wastewater treatment systems (References 108, 124, 140). Some of the modifications have been implemented (e.g., acid/base neutralization in the Middle Creek Surface Drainage System basin) and some have

96. UNIT NAME: Middle Creek Surface Drainage System
 (continued)

not (e.g., transformation of some of the separators to Dissolved Air Flootation (DAF) units).

During the VSI, facility representatives indicated that the interceptor dam had been opened several weeks prior to the VSI during a particularly heavy precipitation event. The dam was raised to prevent overflows of the Middle Creek Surface Drainage System within the facility. Wastewater was discharged to the Delaware River through the bottom of the dam, which operates as an underflow weir to contain floating oil in the basin. Facility representatives reported that PADER officials were notified and reports were filed as is required for any opening of the dam.

During the VSI, the wastewater in this unlined unit was observed to be very dark in color. In some locations near the unit a strong hydrocarbon smell was noted. The surface of the water was observed to support oily sheens in many locations. Throughout the entire unit, the banks of the unlined unit were observed to be saturated with a dark, oily substance in areas where the water line was visible. Above the water line, dark staining was also visible in many areas indicating past overflows. In many locations, large quantities of accumulated dark sludges and residues were observed on the unlined banks and bottom of the unit. The banks of the neutralization basin area and the interceptor dam were observed to be covered with dark oily staining. The basin also contained large quantities of accumulated sludges.

During the VSI it was also observed that sorbent booms and pillows maintained at the water surface of the Middle Creek Surface Drainage System by two bridges located below the interceptor dam and on the downstream side of the dam itself were stained brown, particularly on the under (water) side. The staining indicates that oil (or some lighter-than-water substance) enters the lower portion of the Middle Creek Surface

96. UNIT NAME: Middle Creek Surface Drainage System
 (continued)

Drainage System, which is below the interceptor dam. The downstream side of the concrete foundation of the interceptor dam was heavily stained with a dark substance at the water line. It was also observed that the banks of the downstream reaches of the lower portion of Middle Creek were stained to approximately one foot above the water line.

References: 10, 108, 111, 131, 144, 154, 321, 322, 364,
 368, and 369

97. UNIT NAME: Product Drip Collection Areas
 (Photographs 97.1 - 97.4)

Unit Description: These units are located throughout the facility in areas where small quantities of product chemicals are used regularly. Lubricating oils, cleaning solutions, and other products are dispensed into containers from spigots attached to the bungs of 55-gallon drums stored vertically. Small metal pans (up to four feet by one foot in area with sides up to several inches in height) or small in-ground sumps (up to six inches deep) are located under the spigots to collect drippage. In-ground sumps similarly designed to collect drippage and spills are also located in areas on the docks where temporary connections are made between pipelines transferring products from storage and hoses filling tanker vessels. Based on observations made during the VSI it is estimated that there are between 25 and 50 of these units located throughout the refinery.

Dates of Operation: No specific date of start-up of this practice can be identified but it is likely that products have been dispensed in this manner since the plant began operating. Whether the drip pans and sumps have always been used or were added later is not known.

Waste Managed: These units receive drippage and spills of various product chemicals used at the refinery including lubricating and cooling oils, cleaning solutions, and petroleum products produced by the refinery that are shipped by tanker.

Release Controls: The small metal drip pans and in-ground sumps are designed to control releases to underlying soils and/or paved areas.

History of Releases: A limited number of these units were inspected during the VSI. Of those visited, the bottoms of the in-ground sumps could not be inspected. In some cases it was noted that the drip pans were not large enough to provide spill collection for all product drums or were not located under all the spigots. In addition, several of the drip pans were noted to contain standing liquids. No evidence of release was identified through review of the available files.

References: 369

98. UNIT NAME: Aboveground Tank Containment Areas
 (Photographs 98.1 - 98.12)

Unit Description:

The Above-Ground Tank Containment Areas are located primarily in the northern and central sections of the facility. The unit consists of the earthen and gravel-covered earthen bermed areas around product storage tanks which routinely and systematically release to the soils in these areas. During the VSI, heavy staining was observed in many of these areas and many tanks were observed to be leaking or discharging to these areas. The identified sources of the observed releases were numerous, including management practices, tank leaks through heating systems, and non-specific leaks from pumps, piping, and equipment and/or tanks.

Further, one of the current management practices for removing excess water from the product tanks is to open the pipe at the bottom (or side) of the tank and allow the water to drain directly onto soils in the containment area. According to the facility representatives, the drain pipe is closed at some point after the discharge begins to consist of product. Large areas of staining and free product were observed during the VSI under discharge pipes indicating that the water contains a very high percentage of product and/or the discharges are not stopped before product is released to the containment area. During the VSI, product was observed to be actively releasing into the containment area at one tank and heavy staining and standing liquids were observed in many tank containment areas.

Dates of Operation:

Several of the tanks in the oldest storage tank area at MHR, the H - 13 area, were constructed as early as 1904. It is not known when the containment berms for the area were constructed. Other tank storage and containment areas were constructed as needed for refinery operations. Some tank areas have been taken out of operation or demolished as the plants they were associated with have been taken out of operation or demolished (e.g., the Asphalt Plant Area (SWMU 57) tanks. The tank containment areas shown on the SWMU and AOC Location Map, Attachment A, are currently in

98. UNIT NAME: Aboveground Tank Containment Areas
 (continued)

existence. However, several existing tank containment areas are not shown on the map (e.g., the H-13 area).

Waste Managed: Discharges and leaks of refinery products or feedstocks, such as crude and bunker oils.

Release Controls: The containment areas are themselves designed to control catastrophic releases of stored products to land and surface waters, however they are unlined.

History of Releases: During the VSI, evidence of continuous releases into numerous unlined containment areas was observed. Evidence observed consisted of what appear to be standard management practices, heavy staining and standing oily liquids in numerous containment areas, and active releases in at least one containment. All of the containment areas were not observed during the VSI.

References: 369

99. UNIT NAME: Rail Car Loading/Unloading Areas and Associated
 Tracks
 (Photographs 99.1 - 99.5)

Unit Description: The MHR Rail Car Loading/Unloading Areas and Associated Tracks are generally located along the same corridor as the Middle Creek Surface Drainage System (SWMU 96). Loading and unloading of products in quantity are conducted at specific locations along the rail lines and the associated tracks lead from the rail line gate near Green and Fourth Streets to most of the southern and eastern sections of MHR. Major loading and unloading areas include two locations at the Lubes Services Center, one propane loading location in the LPG area, one location used primarily for off-loading propane and butane at 15 Plant, one location in the R and D area, and one location to the east of Hewes Avenue. The on-site rail system is approximately one mile in length and ranges from approximately ten feet (single rail) to 75 feet (multiple rails) in width.

Dates of Operation: The date of construction of rail lines into MHR is not known but is estimated to have been early in the 1900s.

Waste Managed: Wastes managed in this unit include spillage and drippage of products shipped to and from MHR by railcar.

Release Controls: No release controls were identified for this unit during the VSI or through review of the available file materials.

History of Releases: No evidence of release was identified through review of the available file materials. During the VSI, heavy oil staining was observed between, next to, and along the rail lines in loading and unloading areas. The majority of the length of track within the refinery was observed to have stains beside and between the rail lines. During the VSI it was determined that past railcar management practices included transfer and staging of recently emptied cars with the bottom valves open, thus allowing dripping of residual product along the rail lines within the facility.

References: 369

100. UNIT NAME: Used Oil Accumulation Areas
(Photograph 100.1)

Unit Description: These units are located throughout the facility in areas where small quantities of used lubricating or cooling oils are removed from equipment and machinery. The units generally consist of one or two 55-gallon drums located in process or maintenance areas. The used oils are poured into 55-gallons drums using funnels. The used oil is periodically collected and discharged into Slop Oil Tank V-29 (SWMU 58), from which it is managed through the slop oil system and eventually returned to the refinery production processes. The 55-gallon drums observed during the VSI were situated on concrete process area surfaces, concrete pads, and gravel-covered soils.

Dates of Operation: No specific date of start-up of this practice can be identified but it is likely that used oils have been collected in this manner since the plant began operating.

Waste Managed: Used petroleum lubricating and cooling oils.

Release Controls: The waste is stored in 55-gallon steel drums.

History of Releases: A limited number of these units were inspected during the VSI. Of those visited, the area under the drums could not be inspected. In some cases staining was noted that indicated that some spillage had occurred as oils were poured into or pumped out of the drums. No evidence of release was identified through review of the available file materials.

References: 369

A. AOC NAME: Stained Refinery Areas
(Photographs A.1 - A.6)

Description: During the VSI, areas of heavily stained soils were observed throughout the refinery. The staining appeared to be a dark, oily substance and staining was especially heavy in locations around and under valves, piping, pumps, and equipment. The stained areas varied in size from approximately one-foot square areas around leaking isolated valves or other equipment to greater than several hundred square feet for spill areas. Based on observations made during the VSI it is estimated that there are hundreds of such areas located throughout the facility.

During the VSI, facility representatives indicated that there is a program at MHR to remove and dispose of soils contaminated with oils and other hydrocarbon substances. Current practices for cleanup of spills and leaks includes removal of soil with a front end loader, analysis for oil and grease, mixing with sand if necessary, and off-site disposal under the PADER Module 1 process. Soil is excavated until visual observation indicates that all stained soil is removed. According to the facility representatives, excavated soils typically contains oil and grease in the 2 - 3% range and may contain as much as 18% oil and grease. The sand/soil mixtures contain less than 5% oil and grease, as required for disposal under the Module 1 process. Past practices for removal of contaminated soils (prior to approximately 1980) were not known.

References: 369

B. AOC NAME: Underground Transfer Lines
 (Photographs B.1 - B.3)

Description: Underground transfer lines have been used to transfer crude oil and petroleum products to and from locations throughout MHR since the refinery was first constructed. Underground transfer lines are located throughout the facility and lead from the unloading docks to storage tanks, from storage tanks to process areas, from process areas to storage tanks, and from storage tanks to loading areas. The transfer lines include lines that are currently in use and lines that have been abandoned.

It is believed that the majority of the underground transfer lines are constructed of steel. The pipes range in size from those having inside diameters of several inches up to those having inside diameters of 24 inches or more. Typically, MHR underground transfer lines are located 30 inches below the surface of the soil. No leak detection systems are provided for the lines. Current refinery practice for abandoning underground lines includes cleaning the lines out with water and isolating the abandoned lines with steel plates. Past practices used for abandoning lines are not known.

A program is currently underway at MHR to replace all existing underground transfer lines with aboveground transfer lines. The project is in the early stages, and some lines, particularly in the area of the docks, had been replaced at the time of the VSI. An estimated completion date for the project could not be provided during the VSI.

During the VSI, refinery personnel indicated that leaks from transfer lines occur and are detected through visual observation of the presence of petroleum substances on the soil surface. Repairs are then made as necessary. The file material reviewed indicates that underground transfer lines are believed to be the source of the kerosene-like substance found in the subsurface in the area of Dock No. 2 (AOC H) (Reference 141), and that in 1987 fuel and lube oils were found leaking from a 10-inch transfer line (Reference 152). During the VSI, underground transfer lines could not be observed due to the underground location. However, numerous cases of leaks from and stains around aboveground piping, valves, and other product transfer equipment at the facility were observed during the VSI.

References: 141, 152, and 369

C. AOC NAME: Underground Storage Tank Excavation Areas
 (No Photograph)

Description: During the VSI, facility representatives indicated that approximately 75 - 80 underground storage tanks have been excavated and removed from MHR in the past. A large majority of the tanks were removed prior to the inception of EPA's underground storage tank program. No further information concerning the removed underground storage tanks was available during the VSI.

Based on the age of the facility and the probable age of these tanks, it is likely that many of these tanks have leaked.

References: 369

D. AOC NAME: Underground Storage Tanks
 (Photographs D.1 - D.3)

Description: Five existing underground storage tanks used to store petroleum products were identified during the VSI. These include a gasoline and diesel tank located to the south of the Mechanical Shop, an 8,000 gallon diesel tank on the southeast corner of Blueball Avenue and Second Street, and a diesel tank located to the north of the boiler house in the western section of the facility. According to facility personnel, all of these tanks were recently leak tested and none were found to be leaking.

References: 369

E. AOC NAME: Underground Storage Caverns
 (No Photograph)

Description: Five underground storage caverns are used at MHR to store petroleum products that are gaseous at standard temperature and pressure. The products are stored in the caverns under pressure, in liquid form. The caverns were constructed in the 1950s by blasting storage areas out from within the granite bedrock underlying MHR. The caverns themselves were not observed during the VSI due to their underground locations. The valves and piping used to fill and dispense product from several of the caverns were observed and no evidence of release was identified.

References: 369

F. AOC NAME: 8-C Plant PCB Transformer Area
(Photograph F.1)

Description: During the VSI, staining under a fenced transformer area and along a small trench leading from the area to a grated sewer drain was observed. A label on one of the transformers indicated that it contained PCBs. The transformer area is located to the southeast of the 8-C Crude Unit. The grated drain was reported to be a storm sewer drain (SWMU 95) leading to the Middle Creek Surface Drainage System (SWMU 96).

References: 369

G. AOC NAME: IF Oil/Water Separator Electrical Box
(Photographs G.1 and G.2)

Description: During the VSI a fenced, in-ground concrete vault approximately 15-feet square in area was observed to the southeast of the 1F Oil/Water Separator (SWMU 68). The concrete sides of the vault were approximately eight inches thick. The bottom could not be observed because the vault was full of water at the time of the VSI. The water was a dark color and the sides of the vault were stained with a dark oily material. Facility representatives indicated that the vault was likely an access point to underground electrical equipment.

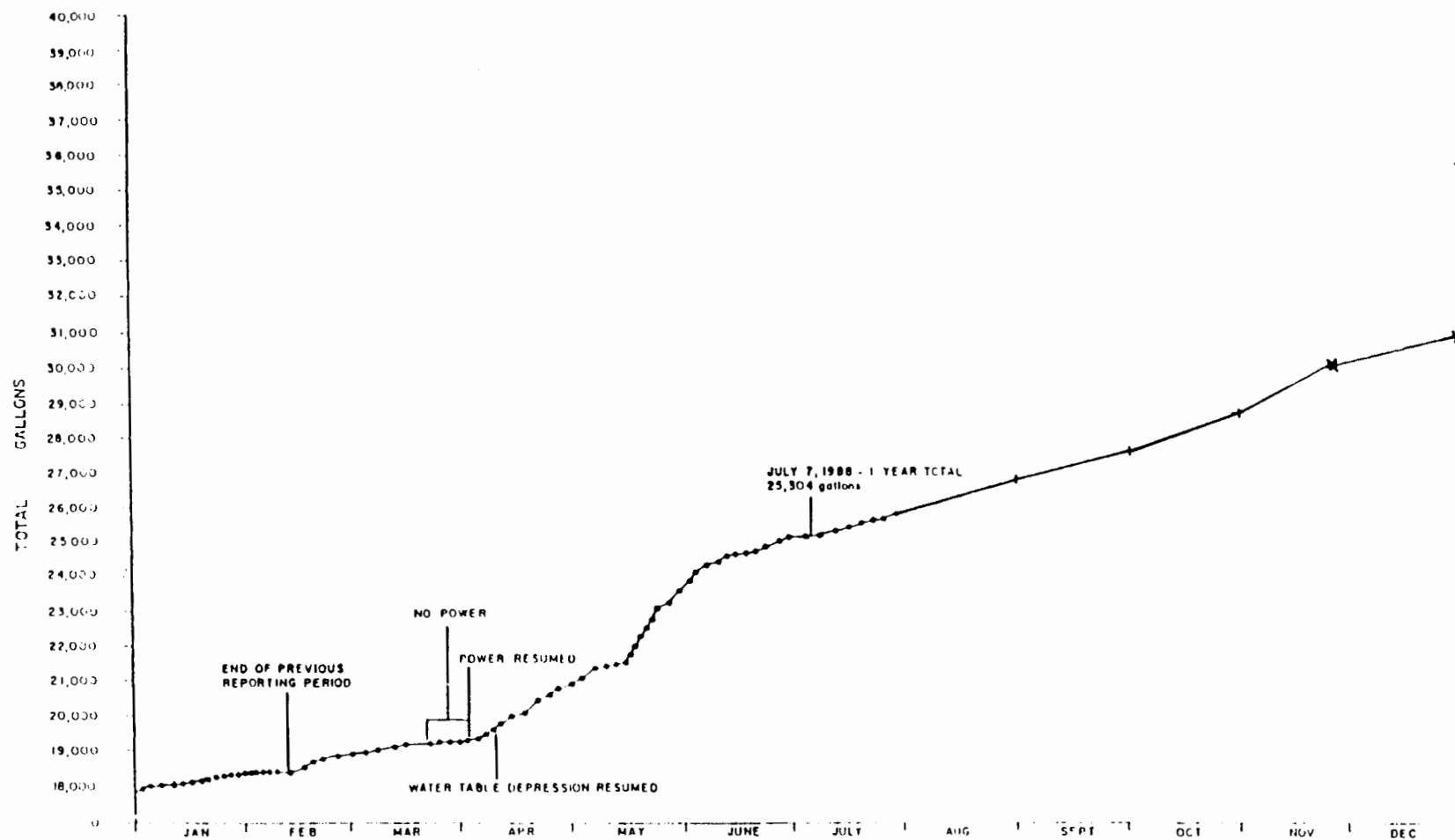
References: 369

H. AOC NAME: Kerosene Contamination Area
 (No Photograph)

Description: The Kerosene Contamination Area is located in the area of Dock No. 2 along the Delaware River in the south section of the facility. A substance **identified by the facility as** kerosene was found in the subsurface in the area. The area was first identified through investigation of reappearing sheens, releases, and tramp product incidents in the nearby Delaware River for which there was no immediate explanation. A recovery well was installed in 1979 to recover the kerosene-like substance from the surface of the ground water (Dock No. 2 Recovery Well, SWMU 51). Total recovery as of the end of 1988 was 31,000 gallons (Reference 147). Product thickness on the water table averaged 0.3 feet in May of 1988 (Reference 141). Figure IV-3 presents a plot of the total amount of product recovered against time for 1988.

Facility personnel reported that the suspected source of the kerosene was an underground **kerosene** transfer line (AOC B). The specific line or the location of the break in the line had not been identified, but the lines in the area of Dock No. 2 had been abandoned and replaced with aboveground lines.

References: 141, 147, 149, 150, 151, 152, 336, 343, 369 and 372



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Figure IV-3: Plot of Product Quantity Recovered from Kerosene Contamination Area (AOC H)
(Reference 147)